

**Political economy of electoral systems:
Electoral disproportionality, its
measurement and its effect on economic
inequality in democracies**

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ABSTRACT

Political parties represent social classes with conflicting interests. Electoral systems have direct and indirect consequences for the parties' access to the decision-making power. A major outcome of the distribution of political power among parties is the distribution of economic resources between competing social groups. Contributing to a growing body of empirical work on the fiscal outcomes of the electoral systems, this study examines the nature of the relationship between the electoral systems and the level of economic inequality in representative democracies. This question is examined through cross-country comparisons on a global scale using cross-sectional and longitudinal data and various statistical methods.

This study uses 'electoral disproportionality' as a widely-popularized continuous metric to distinguish between electoral systems. Electoral disproportionality maybe broadly defined as *the deviation of the post-election party seat-shares in a parliament and the pre-election composition of the party preferences of the voting age population*. As its first major step, this study proposes a new index (called D_a) for measuring electoral disproportionality to addresses certain disadvantages of the existing indices.

In real elections, parties adjust their campaign strategies in part in anticipation of the implications of the electoral rules for their chance of success. Similarly, citizens tactically adjust their voting decisions to maximize the impact of their vote or choose not to vote at all. Commonly, electoral disproportionality is calculated empirically using the outcomes of the past elections. However, due to the behavioural adjustments of the parties and voters, the use of election data often results in an overestimation or underestimation of electoral disproportionality. To eschew the adverse effect of behavioural adjustments on the measurement of electoral disproportionality, this study, as its second major step, introduces and operationalises the novel concept of *systemic electoral disproportionality*. It also develops a methodology based on computer simulation for the measurement of systemic disproportionality. This measurement technique, offers the capability to decompose systemic electoral disproportionality between the various components of an electoral system (districting, electoral formula, thresholds, etc.).

At its third major step, using the proposed measurement technique and index, this research, for the first time, produces data on the current level of systemic electoral disproportionality in 92 democracies around the world.

Finally, and as its fourth major step, this research uses the generated dataset of systemic electoral disproportionality in several statistical modellings covering the period 1978 to 2015 to study the relationship between the electoral systems and income inequality. OLS, fixed-effects and between effects regression models are utilized to test the hypotheses. Results of the worldwide cross-country comparisons indicate that increase in systemic electoral disproportionality does not aggravate the level of net income inequality *per se*. Instead, as democracies mature, the level of systemic electoral disproportionality aligns with the level of diversification of the party system. The latter is shown to be in relationship with cross-country variation in the level of inequality of the disposable income. Findings emphasize the role of party diversification as a causal nexus between the type of the electoral system and the level of economic inequality.

DECLARATION

This is to certify that

- i. *the thesis comprises only my original work toward the PhD,*
- ii. *due acknowledgement has been made in the text to all other material used,*
- iii. *the thesis is fewer than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.*

Araz Aminnaseri

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LIST OF ACRONYMS

AV	Alternative Vote
CPI	Corruption Perception Index
ECI	Economic Complexity Index
ENPP	Effective Number of Parliamentary Parties
FPTP	First-Part-the-Post
GDP	Gross Domestic Product
HAM	Highest Average Method
HDI	Human Development Index
LAV	Limited Alternative Vote
LRM	Largest Remainder Method
LV	Limited Vote
MBS	Majority Bonus System
MMD	Multi-member District
MMP	Mixed-Member Proportional
MNTV	Multiple Non-Transferable Vote
MWC	Minimum Winning Coalition
OSL	Optimal Size of the Legislature
PBV	Party Block Voting
PCP	Party Composition of Parliament
PPAV	Party Preferences of Actual Voters
PPEV	Party Preferences of the Eligible Voters
PPP	Purchase Power Parity
SMD	Single-Member District
SNTV	Single-non-Transferable-Vote
SWIID	Standardized World Income Inequality Database
TRS	Two-Round-System
VAP	Voting Age Population
VEP	Voting Eligible Population

Chapter 1

Introduction to the study

1.1 Introduction

The post-WWII inclusive model of growth, promoted by the social democrat reformist parties in the economically developed democracies, was brought to an end by its own limitations and contradictions. In the aftermath, inequality has increased globally, and has only exacerbated since the outbreak of the global financial crisis in 2008. The prevailing trends of rising inequality within countries in recent decades have renewed interest in understanding the factors that shape and drive this increase (Nolan et al. 2014; Peterson 2017). But why inequality matters in the first place?

For the right-leaning mainstream economists, inequality has been at worst a necessary evil and at best a reasonable price to pay for growth (Birdsall 2001). The left-leaning mainstream economists have a different view; so do the economists belonging to the Marxian school. The opponents argue that inequality hampers growth and slows down the reduction in poverty (Birdsall 2001).

For the poor, it results in lower access to food security, quality health and education (Rowlingson 2011), proper housing and 'the right to the city', and in one word, all routes to escape poverty and intergenerational mobility. From a distributive justice perspective, excessive inequality is seen as the lack of equal opportunities for children (Milanovic 2018). It is shown that variation in life expectancy, the level of infant mortality, homicide, literacy, teenage birth, child wellbeing, trust, obesity, mental illness and drug and alcohol addiction are all related to the variation in economic inequality between countries (Pickett and Wilkinson 2006 & 2009). Also, increase in the between-country inequality represents lost or delayed opportunity for many people in the developing world to reach a level of development enjoyed in more developed countries (Milanovic 2006).

From the political perspective, concentration of wealth in fewer hands, leads to increased concentration of discourse setting power and infiltration of economic power into politics. This, in turn, corrupts the politics and erodes public confidence in capitalism and democracy (Stiglitz 2013). Higher inequality is socially divisive, can result in social unrest, and hence destroys the very means of production which are supposed to bring about growth (Milanovic 2018). The Marxian paradigm views the ensuing social incoherence and unrest not as undesirable outcomes but rather as symptoms of an alienated political model in which in the absence of economic freedom, the concentration of wealth and power allows for promotion of false consciousness and leads to uninformed political choices by the masses of the working class.

Choices that often do not help them advance their class interests including demand for a more equal society.

Marxian economists further hold that higher inequality skews society's economic activity in favour of fulfilling more and more of the desires of the bourgeois class at the expense of the quality of life of the proletariat. It reflects heightened extraction of the surplus value (exploitation) and even if all are better off in the end, it is wrong (and economically and socially damaging) if the fruits of this improvement is not distributed in proportion to the socially necessary labour time contributed by each participant in the economic activity.

Given the adverse effects of economic inequality, it is important for the opponents of economic inequality to find policy responses and solutions that can contain and, hopefully, reverse this trend in the future.

One area that has attracted the attention of the inequality scholars is the intervening role of the state and its political institutions in the distribution and redistribution of economic value in society. Through their policy making and law enforcement powers, states play a vital role in managing taxation and redistribution, dealing with unemployment, decommodifying universal basic services such as health, education, transport and infrastructures, assisting or undermining the organised labour's struggle against capital, and managing the extent and content of allowable economic activity. All of these areas have a significant impact on the level of economic inequality in a society.

Much of the literature that emphasises the role of the state in affecting the level of economic inequality is concerned with the ways in which political institutions may have an impact on the creation of a political environment that favours (or otherwise discourages) actions intended to curb inequality.

The electoral system is one political institution that has been closely scrutinised in studies on inequality. Political scientists concur that electoral institutions play a major role in shaping the incentive structure of the political elite as well as that of the citizens who vote them into office in democracies. The impact of the institutional context of the elections on the political and socio-economic outcomes is mediated through the former's effect on the voting behaviour of the voters and the electoral policies of parties and candidates.

Broadly speaking, two lines of argument have emerged in the literature regarding the causal mechanisms that may explain the fiscal outcomes of the electoral systems. The first strand of theories concentrates on the effect of the electoral systems on (a) the voters' incentive to participate in the election, and (b) the pattern of party preferences of the voters and their voting decisions. This strand includes the *class alliances framework* (Iversen and Soskice 2006; Lupu and Pontusson 2008; Ticchi and Vindigini 2010) and the *class bias of electoral turnout theory* (Gallego 2010).

On the other hand, the second strand focuses on the parties and politicians and how they are likely to position themselves electorally and when in government in response to the impacts of the electoral system on their chance of electability and winning office. This strand covers *universalistic decision-making theory* (Inman and Fitts 1990; Scartascini and Crain 2002; Mukherjee 2003), the *geographic targetability approach* (Persson and Tabellini 1997, 1999, 2000; Debowicz et al. 2016, 2018; Milesi-Ferretti et al. 2002; Lizzeri and Persico 2001), the

coalition effect approach (Kontopoulos and Perotti, 1999, 2002; Bawn and Rosenbluth 2003, 2006; Persson et al. 2003, 2007), the *veto points argument* (Crepaz and Moser 2004) and the *consumer-producer framework* (Rogowski and Kayser 2002; Chang et al. 2011).

From the empirical perspective, there is a common consensus (albeit with exceptions) that higher electoral proportionality can increase the level of public social spending but may not necessarily lower inequality in the distribution of disposable income. Electoral proportionality refers to an allocation of the parliament seats to parties following an election in proportion to their relative share of the valid votes. All empirical studies so far have either applied binary distinctions between proportional and non-proportional electoral systems (e.g., Perotti and Kontopoulos 2002; Funk and Gathmann 2013; Feld and Schnellenbach 2014) or used observable consequences of electoral systems such as the level of party diversification¹ in the legislature or the government (Persson and Tabellini 1999, 2001, 2003; Scartascini and Crain 2002; Mukherjee 2003; Crepaz and Moser 2004; Bawn and Rosenbluth 2006), average magnitude of the electoral districts (Milesi-Ferretti et al. 2002; Alesina and Glaeser 2004; Verardi 2005; Persson et al. 2007) and empirical measurement of disproportionality indices (Milesi-Ferretti et al. 2002; Lupu and Pontusson 2011; Murawski 2015).

Although important progress has been made in investigating the link between the types of electoral systems and the extent and composition of social spending, there are extant important theoretical and methodological challenges in this field.

First, there is no distinction in the literature between electoral disproportionality as a systemic attribute of an electoral system and the possible empirical manifestations of this systemic attribute such as the average size of the electoral district, the effective number of parliamentary parties (see chapter 3 for definitions) or indices calculated from the manifest effects of the electoral systems. Thus, no research has made a distinction between individual electoral systems in use in democracies based on their inherent level of disproportionality. Since there is no one-to-one relationship between systemic disproportionality and its empirically observable manifestations, the existing literature on the fiscal effects of electoral systems has failed to empirically test the relationship that it hypothesises between electoral disproportionality and its policy outcomes.

Second, the proper measurement of electoral disproportionality remains challenging, although many indices have been proposed for this purpose. Apart from technical issues, the existing indices have two major shortcomings: (1) they are not sensitive to the size of the legislature or the number of the seats on offer in an election (as an important disproportionality-inducing factor); and (2) no index has compared electoral disproportionality against a reference point that can be approached practically. In other words, their value cannot be zero in any circumstance.

Third, the literature offers no fully developed methodology for measuring systemic electoral disproportionality (see section 1.3 for definition). The common approach at present is to use the outcome of the elections to calculate the indices of disproportionality. However, this input data is contaminated by the effects of the behavioural adjustments of the voters and political parties to the implications of the electoral rules. Hence, the empirical approach partially conceals the true level of disproportionality, especially in highly disproportional electoral

¹ The number of parties that have a significant presence in the parliament.

systems. Some suggestions have been made for the use of synthetic input data and a simulation method to measure the systemic level of electoral disproportionality; but this approach is still in its infancy (see section 4.1).

In relation to the aforementioned methodological gap, no quantitative data has ever been produced regarding the systemic disproportionality of the electoral systems of democracies around the world. This lack of data is a barrier not just to the field of study that is the subject of this research, but to all quantitative investigations of the political and economic impacts of electoral systems.

Finally, from an empirical standpoint, very little has been done to test the hypothesised theories regarding the distributive impacts of the electoral systems on a comprehensive sample of democracies worldwide. To date, research has focused heavily on developed democracies (mostly the OECD² countries) due to the lack of good quality data on social spending and economic inequality beyond those countries. Additionally, due to the lack of data on systemic disproportionality, the current literature has only dealt with the observable consequences of the electoral systems such as the level of party diversification, and has taken them as proxies for systemic electoral disproportionality.

Due to the nature of the study question formulated below in section 1.2, this thesis focuses on the electoral systems in countries that are considered as political democracies at the time of the study. Dependencies and disputed territories, countries that are war-torn or occupied, countries with failed states, and countries with populations less than 250,000 are excluded from the study sample. Case selection is further restricted by the following two factors: (a) availability of data on economic inequality and its main socio-economic determinants, and (b) availability of data to simulate systemic electoral disproportionality. The latter set of restrictions is further elaborated in chapter 5 and is predominantly related to the methodological challenges involved in the simulation of certain classes of electoral systems or the lack of adequate data or information required for the simulation procedure in some countries. In terms of geographic coverage, our sample of 92 democracies includes 15 countries in Western Europe, 19 countries in Eastern Europe and the territory of former Soviet Union, 22 countries in Latin America, two North American countries, ten countries in Asia, two in the Middle East, 19 in Sub-Saharan Africa, and three Oceanian countries (graph 1.1). Various longitudinal analyses cover periods from 1978 to 2015 depending on the nature of the specific questions and the availability of data.

² Organisation of Economic Cooperation and Development

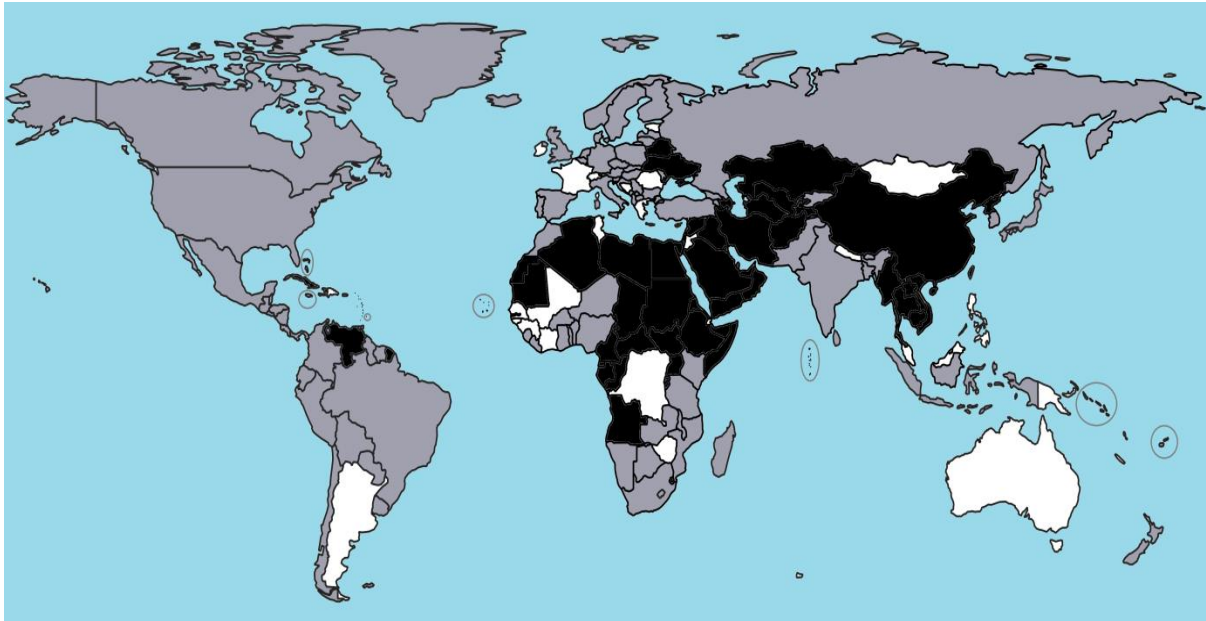


Figure 1.1

Countries included in the study sample (grey) compared to the potential study population (grey and white). Countries in black do not qualify for inclusion in the population.

1.2 Research questions

There has been a significant increase in the amount of research on the economic effects of electoral systems. However, many theoretical and empirical questions have yet to be explored. This study attempts to draw attention to the role of political competitiveness in controlling the level of economic inequality. By developing a new approach to the study of electoral systems and their systemic attributes, and by expanding the geographical scope of the study, it seeks to shed light on the dynamic processes mediating between electoral systems and the distribution of economic resources that have been hitherto untested. This dissertation will be guided by the following general research question:

How are public social spending and the distribution of income in societies influenced by the systemic attributes and observable consequences of their electoral system types?

To answer this general question, certain analytical steps have been taken through chapters. Each chapter is guided by a specific research question and several probes to address the distinct aspects of that specific question.

Chapter 3 is centred on the following question:

How can electoral disproportionality be measured correctly on a continuous scale?

This chapter develops a theoretical framework for interpreting electoral disproportionality and operationalises an index for this purpose by answering the following questions:

- Which attributes should a proper continuous index of electoral disproportionality have from a theoretical perspective?
- How do the existing indices of electoral disproportionality compare with the proposed ideal index?

- Which of the existing indices used to measure electoral disproportionality include the expected theoretical attributes? and if none,
- What alternative index of electoral disproportionality may be proposed that would be capable of fulfilling the theoretical expectations?

The specific question which is the focus of chapter 4 is:

What methodology can accurately measure an index of electoral disproportionality?

This chapter will conceptualise the idea of systemic disproportionality as an abstract identifier of an electoral system and proposes a methodology for the measurement of systemic disproportionality. The objective of this chapter is to answer the following questions:

- What is systemic electoral disproportionality and how is it different from the de facto electoral disproportionality measured at every election?
- What are the disadvantages of the common empirical approach to the measurement of electoral disproportionality?
- What alternative measure can be developed to accurately measure systemic electoral disproportionality?
- What are the limitations of the proposed simulation method?
- What are the theoretical and practical considerations to take into account when applying the simulation methodology?

Chapter 5 is concerned with a practical task. It asks:

What is the level of systemic electoral disproportionality of the current electoral systems used by the sample of democracies considered in this study?

To answer this question, the index and methodology developed in chapters 3 and 4 are used to produce systemic disproportionality data. The process allows two additional questions to be addressed; although not central to answering the main question of this study, they are in themselves important contributions to the field of electoral studies. These two questions are:

- How do electoral system families compare based on their associated level of systemic disproportionality?
- How do the different components of the electoral systems (and their mutual interactions) contribute to the overall systemic disproportionality of these systems?

Finally, chapter 6 builds on the existing literature and the outcome of the previous chapter to answer the following specific question:

How does the systemic disproportionality of electoral systems affect economic inequality in the democracies constituting the comprehensive sample used for this study?

Several statistical analyses are conducted in this chapter directed by four ancillary questions:

- When assessed quantitatively, to what extent is the relationship between electoral proportionality and economic equality, as proposed in the existing literature, evident in the democracies considered in this study?

- Are there conditions that, if met, would indicate a causal relationship between electoral proportionality and the level of income equality in a world-wide cross-country comparison?
- Is there a within-country relationship between party diversification and change in the level of income inequality? And if so, is this relation impacted by the stage of economic development of the country?
- What are the theoretical implications of the findings of this study for the assessment of existing theories regarding the effects of the electoral systems on economic inequality?

1.3 Definitions, methods and data

Before turning to issues pertaining to data, design and statistical modellings used throughout this thesis, it is important to define some of the key concepts used in the overarching and specific sub-questions in order to understand the work that follows.

Systemic vs. empirical electoral disproportionality: electoral disproportionality is a central character of the electoral systems and is often the foundation for the classification of electoral system types in electoral studies. In these classifications, electoral systems are identified by the level of disproportionality that is attributed to them in theory. This is exactly what is meant by systemic electoral disproportionality which is a metric that is inherent in, and nearly unique to, every electoral system design, and depends solely on the design elements and the demographic context in which the system is applied. However, when this theoretical and qualitative concept is quantitatively reported in the literature, it is calculated using the manifest outcomes of the electoral system, such as the structure of the electoral districting or the election outcomes. Throughout this thesis, the latter metric is called *empirical electoral disproportionality*. The proportionality that is realised empirically is a distortion of the systemic disproportionality due, in part, to the impact of demographic factors. An even greater distortion is caused by voters' strategic revision of their voting decisions to maximise the impact of their vote on the outcome of the election based on what they know about the operation of their particular electoral system (see section 4.1 for further elaboration).

The optimal size of the legislature: refers to a compromise between proper representation which, among other things, entails a large enough parliament and the practical implications of maintaining an oversized legislature. The idea has empirical origins and was developed through the works of Smith (1910), Rein Taagepera (1973), Lijphart (1999), Auriol and Gary-Bobo (2007), and is revised in this study.

Decomposability of electoral disproportionality: A decomposable index may be defined as the measure of a population whose aggregate value can be broken down into a weighted sum of the values of the index within population subgroups, plus a weighted sum of the values of the index in different combinations of the population subgroups (Bourguignon 1979). In the context of electoral disproportionality, decomposability refers to the breakdown of the total disproportionality of an electoral system to the disproportionality caused by each of its constituent components (rules) in addition to the decomposability caused by the interaction between these components.

Party diversification and political competitiveness: party diversification refers to the level of diffusion of decision-making power between the parties. Typically, its measurement is based on the pattern of distribution of decision-making seats between parties in a decision-making body such as the parliament or the cabinet. A common metric for the measurement of party diversification is *the effective number of parliamentary parties* (ENPP) according to formula 3.11 in chapter 3. A common alternative expression for the concept of party diversification is *party fragmentation* which is often used to describe the situation where too many parties are represented in a decision-making body. The latter interpretation has certain applications in political science. But since the negative connotation associated with this reading is not relevant to the concerns of this research, use of the term has been restricted to quotations from the literature.

Party diversification is often symptomatic of an increase in the level of competitiveness in the political system. When electoral popularity is not concentrated within one or two parties, and there are many contenders in an election, parties have to deliver more in order to successfully mobilise their potential voting base. In other words, more parties have to compete for votes. Yet, drawing an exact parallel between party diversification and political competitiveness would be misleading for the reasons enumerated in section 6.3.1.

In the following paragraphs the data, design, and statistical modellings used in this study will be briefly introduced.

To make the computer simulation possible, first a framework of inclusion is designed. This framework allows us to decide which aspects, components and types of electoral systems can be simulated given the availability of data and theoretical considerations. Also, certain parameters of the simulation model such as the rate of turnout, threshold of representation, number of parliamentary parties and total vote-share of the parliamentary parties are established using the empirical election data and referring to the available theoretical insights.

Second, an input sample of 10,000 national voting patterns is generated to feed into the simulation algorithm. The sample is designed such that its particular statistical attributes resemble those of a smaller dataset of observable voting patterns under the least disproportional electoral systems ever used in democracies. This approach is adopted due to the fact that the voters' behaviour under the proportional systems is least contaminated by tactical adjustments and presents a more genuine expression of citizens' political preferences.

Most electoral systems involve sub-national districting. Consequently, simulation of elections in these systems requires information about the voting outcomes in local electoral districts. In the third stage, a method is developed to break down into local districts the national voting patterns of the input sample. This method fulfils three criteria: (1) a given voting population per every district, (2) a given overall number of votes per parties, and (3) the random breakdown of national vote between districts.

Next, customised algorithms are developed for the simulation of different electoral system categories and various countries within each category with local characteristics. These algorithms are written in the Python programming language (version 3.5). They are applied to translate the vote shares of the parties into respective seat shares in the parliament based on each country's local set of rules, and to calculate the ensuing disproportionality using the D_a

index (see section 3.4 for index definition). The allocation is repeated 10,000 times over the entire input sample and the final result is reported as a sample-wide average.

Finally, to acquire more insights about the role of certain system components, or the interaction between multiple components and its impact on final disproportionality in each electoral system category, modules of interest are deactivated in the electoral system of the country that is presented as a typical example of that category and stages two, three and four are repeated to extract the level of change in systemic disproportionality produced by the exclusion of those components.

To address the specific research questions of chapter 6, different statistical models will be estimated. While used for different purposes, these models will have one central concern in common, namely: how the systemic disproportionality of electoral systems may influence the level of social spending and economic inequality in democracies.

Our empirical analysis involves cross-sectional and longitudinal data spanning four decades (1978-2015), and drawn from a moderately imbalanced panel dataset³ of countries. Systemic disproportionality and the effective number of parliamentary parties are the two independent variables used in this study. Income Inequality is the key output variable. The control variables used in our various models include the age of democracy, the structure of the veto points (presidentialism, federalism), the level of corruption, exposure to globalisation, and the level of economic development measured by a variety of indices including gross domestic product (GDP) per capita adjusted according to purchase power parity, the economic complexity index and the human development index.

Income Inequality is measured by the Gini index using the ‘Standardised World Income Inequality Database’ (v 6.0 2017). The effective number of parliamentary parties is calculated for different election years using data released by the national electoral commissions of the countries. The presidentialism data is based on Elgie’s categorisation and data (Elgie 2016). The level of socio-economic development is measured by three metrics: (1) GDP PPP per capita based on data from the International Monetary Fund and the World Bank, (2) the economic complexity index produced by Harvard’s Centre for International Development, and (3) the human development index (compiled by the UN). Political corruption is measured using the corruption perception index produced by Transparency International. Globalisation is operationalised as the share of foreign trade in the domestic gross product. Data for this variable is sourced from the World Bank. Finally, Age of Democracy is calculated from the democracy index database produced by Freedom House annually since 1972, and Polity IV Project scores for 1800-1972.

Since our systemic disproportionality data is time-invariant (cross-sectional) and ‘party diversification’ is a low-variation estimator (i.e. within an electoral system it changes very little over time), a between-effects model over a short period of five years is used to assess the direct relationship between systemic electoral disproportionality and the level of net income inequality (i.e., the inequality of disposable income.) The between-effects model uses a collapsed dataset comprising the means of time-series data to compare the variation in the output between units as a result of the difference in their independent variables. This model is suitable because net income inequality has a higher variation frequency than its two main

³ A panel with some missing data for some countries in some years.

estimators in the model. Similar models have been used in this study to test the effect of the electoral systems on the distribution of gross income and the level of reduction in inequality as a result of government taxation and transfers.

Further, the relationship between party diversification and the level of gross and net income inequality will be tested using between-effects models over the entire study period of this research. The same question has been studied using ordinary least square regression models for cross-sectional analysis of the study period year by year.

Finally, fixed-effects models are fitted to the data in order to address two questions: the relationship between systemic disproportionality and party diversification in democracies, and the within-country relationship between party diversification and the level of net income inequality. Fixed-effects modelling is appropriate for this analysis because it enables the control of unobserved time-constant case-specific effects in the model. Under the fixed-effects model, all cases are assumed to share a common effect size because all factors that could influence the effect size are the same for all case studies (Borenstein 2009).

1.4 Significance of this study

This dissertation makes several contributions by addressing the theoretical, methodological, and empirical gaps identified in the literature. First, in terms of theory, it presents a systematic and critical review of the relevant literature that delineates its boundaries and evolving frontiers, exposes its shortcomings, and offers a comprehensive framework to classify the existing theories. By comparing and contrasting different approaches to the study question, this classification makes the lines of division in the literature clearer, facilitating the assessment of broad approaches and specific proposed models.

Second, this study carefully classifies the indices of electoral disproportionality and assesses the merits and weaknesses of each in order to select the best. Further, by offering solutions for two specific theoretical problems associated with the use of existing indices, it offers a new index based on the Loosemore and Hanby (1971) index of electoral disproportionality. This new index is named the D_a index.

The third contribution of this dissertation is also related to methodology. To brake with the common empirical approach to the measurement of electoral disproportionality and the problems that follow from the use of the empirical approach, we build on the works of Karpov (2008), Linusson and Ryd (2013), McGann et al. (2016) and Magar et al. (2017) to develop an alternative computer simulation approach. This approach, based on the introduced concept of systemic disproportionality, is further developed into a new methodology with detailed design considerations, procedures and algorithms. As is the case with the D_a index, the usefulness of this methodology extends beyond this specific research and benefits the field of electoral studies in general.

In empirical terms, this thesis is the first to produce a dataset of systemic disproportionality using the D_a index and a simulation methodology for the most contemporary electoral systems in 92 democratic regimes throughout the world. The measurements also enrich the existing qualitative debate concerning the typology of electoral systems by enabling quantitative and very precise comparisons to be made between the various families and classes of electoral

systems. Related to this, another innovative aspect of this research is that it offers a tool to decompose the aggregate electoral disproportionality of electoral systems into their constituent components. From a theoretical perspective, this would enable the study of each design component and its significance in the system, as well as the interactions between these components and their combined impact on electoral outcomes and, more specifically, on the distortion of these outcomes from vote-seat proportionality. From a policy perspective, decomposition offers detailed information about the role of various electoral rules on the aggregate disproportionality of a system which in turn may lead to better system designs and more informed decisions in regard to electoral reforms.

Finally, longitudinal and cross-sectional modellings in this study enable the determination of the causal path that links the systemic attributes of electoral systems to the economic distributional outcomes. This empirical analysis is made possible by the use of the produced dataset on systemic disproportionality in statistical modellings.

A key conclusion of the study is that the effect of electoral proportionality on net economic inequality is indirect and through the intermediary of party diversification and party competition. Proportionality and party diversification align with each other over time as democracies mature within the boundaries allowed by the electoral system design. Further, the same effect is not observable on the market income and the level of government spending. It is also shown that the strength of this effect is at its peak in the middle stages of economic development in countries.

The findings of this study have important theoretical implications. They highlight the role of party diversification as the nexus between the type of electoral system and the predicted level of economic inequality. They also allow inferences to be drawn about the mechanisms that are likely to be involved in translating the effects of electoral systems to distributional economic outcomes. Most notably, they allow for judging the relative importance of the role and decisions of the voters and politicians in forming the distributional outcomes, something that has been contested in the literature. Our investigation shows that theories that focus on the adaptation of parties and politicians to the electoral implications of different electoral system designs are better capable of explaining the effect of electoral institutions of economic distribution.

Because our sample comprised a comprehensive range of democratic regimes worldwide, the conclusions of the study are strengthened, placing it one step ahead of the previous research that tended to have a more limited geographic scope.

1.5 Outline of the thesis

This chapter offered an overall introduction to the area of study and the specific questions that this research will address.

Chapter 2 examines the literature on electoral disproportionality and also the literature on the relationship between electoral disproportionality and economic inequality. The first literature stream deals with the causes of electoral disproportionality and how it can be measured. The second literature stream targets the causal mechanisms that explain how electoral rules may

impact on the motivation of the political establishment to tackle economic inequality through taxation and redistribution, labour market policies and regulation of industrial relations.

Chapter 3 introduces a new index for the measurement of electoral disproportionality by critically reviewing the existing measures and their shortcomings.

Chapter 4 introduces the concept of systemic disproportionality and proposes a simulation-based methodology to be used with indices of disproportionality to measure systemic disproportionality. Broad design aspects of the methodology along with the algorithms required for the generation of sample input data and the computational procedure are elaborated in this chapter.

Chapter 5 discusses some context-specific aspects of the simulation method design and presents the results of computer simulation for the measurement of systemic electoral disproportionality for the most recent electoral systems in 92 democracies across the globe. The index proposed in chapter three is used for producing data on systemic disproportionality in this chapter.

In **chapter 6**, data produced in the previous chapter is used to quantitatively assess the strength of the relationship between electoral proportionality and economic equality using a global sample of democratic countries. Some hypotheses are developed and assessed regarding the nature and quality of this relationship and the factors that influence it.

The concluding chapter, **chapter 7**, summarises the findings of this research and draws conclusions about the theoretical implications of the findings of this study for a better understanding of the mechanisms through which electoral reforms may facilitate economic equality.

Chapter 2

A review of the literature on the electoral determinants of economic inequality

2.1 Introduction

It was stated in the first chapter that one of the central goals of this dissertation is to study the distributional impacts of the electoral systems on a global scale using the available empirical data. More specifically, we want to find out whether the positive relationship between higher proportionality and lower economic inequality, which is claimed by the current literature, may be generalised to all democracies worldwide when using a high precision measurement of proportionality; and if so, what mechanisms are more likely to govern this relationship. It was also highlighted in the introduction that vote-seat disproportionality has been selected in this research as the preferred quantitative index to differentiate between the electoral systems.

In this chapter we review theories that have been proposed to explain the relationship between national electoral institutions in democracies and the social distribution of economic outcomes. We do so in an attempt to discover which schools and theories in the literature offer the best insights to address the study question. With disproportionality being selected as the prime identifier of the electoral system types, we need to develop a theory that takes this continuous index as its explanatory variable and offers insights into the potential mechanism (or a set of intermediary variables) that establish a causal path to the interval level dependent variable either being the level of economic inequality or the level of public social spending.

Numerous theories have been developed over the past 40 years to assist in the understanding of the fiscal effects of electoral systems. In this chapter, 14 theories, set out in two broad categories and eight classes, are scrutinised. Apart from their general approach to the question and the causal mechanisms proposed, these theories differ widely regarding methodologies used in their parametric models, the level of details attended to in their assumptions, and the type of variables used to represent different concepts. As a result, simply looking at the formal arguments of these theories does not disclose their true potential and gaps. Rather, an accurate judgement about the merits and/or weaknesses of the theories and their usefulness for the task in hand requires a thorough investigation of the details associated with each, such as compare-

and-contrast approaches, assumptions, and specificities of model designs. This task perused over the next sections of this chapter.

In assessing these 14 theories and their usefulness for this research, we try to answer two sets of questions:

The first set of questions is concerned with the ability of each theory to handle continuous input and output variables, and offer a causal explanation that allows for graduated change in the intermediary variables that are supposed to link the electoral system to fiscal outcomes (specifically the level of economic inequality). We ask: What are the intermediary variables that are proposed by the model to explain the relationship between proportionality and social spending or the level of economic inequality? Does change in the level of proportionality cause any intermediary variable of the model to change at the interval level? Does the theory suggest a direct link between the dependent and independent variables?

The second group of questions investigates the quality of each theory and whether it is solid and consistent enough to guide the subject of inquiry of this research. Conversely, we want to know what kinds of assessments our empirical investigation can make regarding the validity and quality of the existing theories or classes of theories. Criteria that are examined in dealing with the existing theories include:

- Is the design of the model realistic, cohesive and free from major contradictions?
- Are its assumptions realistic and sufficient for the hypothesised relationships? For example, is there consistency between the type of electoral system and the consequent party-system?
- Does the model capture the key aspects of the electoral dynamics: most notably electoral uncertainty, competition, and uncertainty around coalition formation and survival?
- Are the causal relationships well-elaborated?
- To what extent does the theory make clear and correct predictions about the reality?

The majority of papers in this field trace the origins of the debate to no earlier than 1981 when Meltzer and Richard published their seminal work, *A Rational Theory of the Size of Government*, in an attempt to explain the dynamics of government formation and welfare redistribution under the majoritarian electoral system in the United States. Since then, many arguments have been developed, challenged and refined to explain the subtleties of the interaction between political institutions and the level of redistribution; and to extend the coverage of the theory to proportional and mixed (or semi-proportional) systems. Over time, and as a result of these attempts, the theoretical frontlines have taken a rather solid shape.

The broad consensus in the literature is that regardless of temporal changes, governments under the proportional electoral systems tend to redistribute more than their counterparts under majoritarian systems at every cross-section in time, and are associated with less economic inequality henceforth (see table 5.1 for a list of studies that make such a claim thorough statistical modelling). This, nonetheless, is not a causal inference, since both the type of electoral system and the level of inequality can be attributed to more pivotal factors such as the economic model a country runs on and the cultural and historical impacts of institutions that have emerged in different societies just to name a few.

Regardless, difference arises in the literature where the competing theories seek to explain the causal mechanisms that link electoral institutions and the dependent variable of interest (be it the actual level of taxation and social transfers carried out by different government types or the aggregate level of economic inequality).

To give structure to this survey, the literature has been split into two broad categories.

The first category of theories looks at the voter decision-making processes under different electoral designs to explain the varied chances of parties that are in favour of more economic equality and/or higher social spending (hereafter referred to as pro-redistribution parties) to be in government. We label this category the *voter-centred theories*. Several models in this category focus on class dynamics as their explanatory mechanism, and a majority of the theories gravitate towards the idea of higher likelihood of a left-partisanship under more proportional systems.

The second category consists of theories that are basically preoccupied with explaining how politicians and parties position their agenda and their deeds differently with regard to the question of redistribution and equality under different electoral rules. We label this category: the *politician-centred theories*. Reliance on class analysis is less common in this category, and except for one, all theories interpret the distributional differences among electoral systems as the result of change in the political centre of gravity; i.e. the universal shift of all parties to the left or right, as opposed to the left or right composition of government.

Section 2.2 explores the first category of these theories, whereas section 2.3 deals with the second category. Conclusions are presented in section 2.4 as to a suitable model to be used for the empirical inquiry presented in Chapter 5.

2.2 Theories modelling voters' behaviour (voter-centred theories)

Three major arguments can be distinguished in these three theories:

- 1 'The median voter' argument
- 2 'The class alliances' argument
- 3 'The class bias of turnout' argument

We elaborate on these arguments in sections 2.2.1, 2.2.2 and 2.2.3.

2.2.1 The median voter model

The 'median voter' theory is, in fact, not a theory to explain the distributional differences between electoral systems. This theory was initially developed to explain the time variations of a government's willingness to put into practice the redistribution and provision of a more equitable economic outcome for its citizens. The emergence of the 'median voter' theory was a precursor to the formulation of a more complicated 'class alliances' framework to compare the distributional outcomes of different electoral system types. Still, understanding the logic behind the 'median voter' hypothesis as a proto-theory in the field is necessary for understanding the evolution of its more contemporary 'class alliances' counterpart.

The conventional theory of 'median voter' was first formulated by Hotelling (1929), Bowen (1943) and Black (1958) for a voting scenario in which two candidates/parties compete to win a simple majority of the votes. The theorem maintains that in this situation, two candidates should converge to identical policy positions, which is the one preferred by the voters standing in the middle of the socio-economic spectrum (the median voters) (Romer and Rosenthal 1979). Around the mid-1970s, the first applications of this theory appeared in social policy studies through the works of Romer (1975), Roberts (1977), Romer and Rosenthal (1979), and later and most notable among them, Meltzer and Richard (1981). All of those theories sought to explain the size of government or the level of government social expenditure by looking at the electoral dynamics.

Romer (1975) looked at the effect of a majoritarian electoral system on the progressivity of the tax system. He claimed that under majority voting system with individualistic and profit-maximizing voters and no altruism, even a right-skewed distribution of before-tax earnings (indicating a high level of income inequality) may result in voters favouring a regressive tax system, or at least one that may not be as progressive as it would otherwise have been based on a Rawlsian maxi-min criterion.⁴

In his conceptualisation, Romer also makes the assumption that voters have single-peaked utility functions, that is, there is only one level of taxation that is the optimum for every voter. Roberts (1977), on the contrary, maintains that voters' preferences may themselves be affected by the level of taxation, which means that a voter who prefers a level of taxation equal to $x\%$ may also agree to a level of taxation equal to $(x + 20)\%$ because this much increase in taxation may bring them results that are equally desirable. For example, someone owning a car may oppose increased taxation to expand the public transport system, but if investment in public transport increases sufficiently enough so that the individual feels that she can sell their car and rely solely on the public transport system, then this taxation level may also be agreeable to them. Given this observation, and assuming a linear income tax rate, Roberts argued that under majority rule, and despite relaxing the assumption of single-peakedness of the preferences, there would still exist an equilibrium level of taxation which is determined by the rank-order of the median voter compared to the voter with an average income.

Meltzer and Richard tried to answer a more general puzzle. They sought to establish a theory with which to explain the historical rise in the level of taxation and government expenditure since the expansion of franchise in Western democracies and up to their time (i.e. the 1970s). They found the answer in a general equilibrium model of public choice which in their view could predict the timing of power handovers between pro-redistribution and anti-redistribution governments in democracies.

Simply put, they maintained that in a democracy where parties are aligned along class lines, the only voter that matters in determining the outcome of the elections is the so-called 'median voter'; i.e. the voter whose preferences fall between those of one half of the voters to its right and another half to its left. In the context of government expenditure, the median voter is the voter with the median income, and the one who decides whether more redistribution will be in her interest or not; accordingly, she will vote for the party/coalition that is pro-(anti-) redistribution.

⁴ According to this criterion, a distribution system at all times should seek to maximise the position of those who will be worst-off in society (Rawls 1974).

When the distribution of pre-tax income is right-skewed (the pre-tax income is concentrated in fewer hands) the voter with the median income is poorer than the voter with the mean income. The vote of the median voters (voters with income between the mean and the median) are the only voters that are key to winning the election for both the left and the right parties. Assuming that each side of politics would favour its own constituency and the redistribution system is non-regressive,⁵ then if the median voter votes for the pro-redistribution party this party, when elected to office, would redistribute from the richer 50% of the population to the poorer half. Hence, the voter with a median pre-tax income would benefit from better welfare services. Under such circumstances, the median voters choose to vote for the party that is in favour of more redistribution. Conversely, when distribution is left-skewed and the median voters are richer than the voter with a mean pre-tax income, they will favour less redistribution and vote for the party that represents the interests of the richer constituency.

Several assumptions must hold concurrently for this synthesis to be true. Meltzer and Richard make seven explicit assumptions in their model:

1. The electoral system is majoritarian,
2. Self-centred, profit-maximising rationality governs the behaviour of (almost) all voters,
3. Voters are fully informed about party positions and the consequences of alterations in the tax system for their net income,
4. Voters' preferences are single-peaked,
5. The only government activities are redistribution and taxation (single-dimensionality of the politics),
6. The real budget is balanced; i.e. the cost of redistribution is not carried forward to future years/governments, and
7. There are no taxes on capital gains or property ownership.

The first assumption regarding the type of electoral system is critical because it is often only under the majoritarian rules that a two-party party system is likely to emerge. In multi-party systems, where ruling coalitions are formed after the outcome of the parliamentary elections are revealed, usually it is not only the median voter who decides whether a left or right government is going to form. Rather, the post-election coalitions are sometimes pragmatic amalgamations of parties on different sides of the economic left-right divide. It is not to say that the median-voter logic never holds under multi-party arrangements (often associated with proportional electoral systems); however, on numerous occasions it is not the case and the median-voter narrative is to be used with caution and modifications. Some scholars have taken up the task of applying the median-voter narrative to proportional arrangements. These will be elaborated in the next section.

Assumptions 2, 3 and 4 focus on the characteristics of the voters. Assumptions 2 and 3 about the self-centred, rational, and informed actor have been critically challenged by the advances in behavioural science since the formulation of the median-voter theory (see for example Pontusson and Rueda 2008). As noted above, assumption 4 about the single-peakedness of voters' preferences has been questioned by Roberts (1977) and Moene and Wallerstein (2001) among others.⁶ Finally, assumptions 5, 6 and 7 are often simply unrealistic simplifications as

⁵ This means that the redistribution system does not redistribute from any poorer voter to any richer voter. This assumption is not made explicit in the model.

⁶ Moene and Wallerstein focus on the social insurance aspect of the welfare state and argue that at least this aspect (which they argue is a sizable portion of social spending) declines with an increase in income

elections are concerned with multiple issues of national interest: the national account is often in deficit (or surplus) and government expenditure comprises sizable non-redistributive items, such as public administration, debt-repayment and defence. Romer and Rosenthal (1979) also warn that while the median-voter theorem might generally hold in explaining the variation in the level of government spending, the complexity of the political institutions, and the effect of other institutional factors in causing government spending to deviate from the preference of the median voter must not be underestimated.

The literature points to at least three other critical preconditions for the validity of the median-voter theory that are omitted from the work of Meltzer and Richard. These include:

1. *A Non-regressive taxation system*

In a non-regressive taxation system, no one with a high pre-tax income would benefit from the redistribution more than someone with a lesser pre-tax income in their immediate proximity. If this assumption does not hold, both left and right parties can redistribute from their opponent's constituency to the median voter in order to appease them (Soskice and Iversen 2006).

2. *A homogenous electoral turnout rate across the income distribution*

There is evidence of a systematic lower rate of electoral participation among low income earners in democracies (Lijphart 1997, McCarthy, Poole and Rosenthal 2006, Mahler 2008). As a result, the median voter is always richer than the median gross income earner because people with less income tend to participate less in the elections. Subsequently, the median voter will always benefit from keeping the rate of redistribution low. McCarthy, Poole and Rosenthal (2006) and Nagler and Leighley (2007) point to the increase in the share of poor non-citizens from the US population, and the widening gap between the median voter and the median pre-tax income-earner in the past three decades. They argue that because this group of residents are ineligible to vote, but are accounted for in the calculation of economic inequality, their mounting inequality has not been able to produce electoral pressure for more redistribution as predicted by the median-voter theory.⁷ Mahler (2008) finds that the income bias of the turnout supersedes the median-voter hypothesis in explaining intra-national temporal variation in post-tax income inequality.

Pontusson and Rueda (2008) see the problem slightly differently, but come to a similar conclusion. They break with the problematic assumptions of the median-voter theory about the single-peaked preferences and the association between preferences and income. They simply hypothesise an electorate that is divided between the pro-redistribution and anti-redistribution camps. However, they stress that instead of the median voter's preference, it is the kind of inequality in question, and the degree of mobilisation among low-income workers, that determine the level of redistribution in a country. The constituency of the left parties cares about the level of pre-tax wage

inequality when income insurance is solely provided by the government and the distribution of unemployment risk is constant. But their finding does not disprove the median-voter logic.

⁷ Technically this is not a violation of the Meltzer-Richard theory because it is similar to the case of limited franchise present until the twentieth century in Western democracies. This scenario has been explained in the Meltzer-Richard theory.

inequality, while the right parties' constituency is sensitive to disposable family income inequality. Eventually, what will be critical in determining the level of redistribution in their model will be the level of income bias in the turnout, and whether the left parties are capable of mobilising the vote of low income citizens.⁸

3. Certain degree of post-election commitment of the parties to their loyal constituencies and their electoral platforms

Several scholarly researches in political science have shown that, for various reasons, parties show limited commitment to their electoral platforms once elected to office (Pontusson and Rueda 2008).

From an empirical standpoint, the median voter theory does not withstand the evidence from the post-1980s era. Meltzer and Richard argued that expansion of the franchise around the turn of the 19th century in Western democracies resulted in more low income people eligible to vote and accordingly shifted the position of the median voters down the distribution of income (i.e. made them more pro-redistribution). This, they argued, is the mechanism that explains the gradual increase in the fiscal size of Western governments. They also applied the same logic to the post-WWII expansion of the welfare state. However, neither Meltzer and Richard, nor the other three studies quoted above had empirical data at their disposal to test the validity of the median voter hypothesis, nor had they faced the challenge of stagnation or decline in welfare spending despite the increase in income inequality that has engulfed Western democracies in the 21st century (see for example, Piketty and Saez 2003; Piketty and Goldhammer 2014).

Milanovic (2000) used the median voter hypothesis to investigate whether it is capable of explaining the differences in economic inequality between countries. He maintained that, if based on the Meltzer-Richard theory, higher initial inequality leads to a higher level of redistribution then we should be able to see that in countries with higher factor income inequality⁹ the poor should gain more from the contribution of taxes and transfers to their disposable income. Looking at statistical data covering the last two decades of the 20th century, Milanovic confirmed that countries with a higher factor income inequality transfer more to their low income population. However, he also found that the level of this transfer is not big enough to put their final distribution at par with their counterparts in countries with a lower factor income inequality.

Milanovic also offered one of the first empirical tests of the median voter theory by addressing an important missing aspect of the Meltzer-Richard formulation. He did so by categorising old age pensions as a factor income instead of redistribution, arguing that pensions are in reality deferred wages with limited redistributive scope. Milanovic realised that when this definition of factor income is used, the statistical significance of the model decreases practically to zero, which means that once pensions are eliminated from cash transfers, the median voter's gain or loss in redistribution is independent of the initial (factor) distribution.¹⁰ This can be another way of coming to the conclusion that in a mixed sample of majoritarian and proportional

⁸ The related literature is thoroughly dealt with in section 2.2.3.

⁹ The distribution of pre-tax income.

¹⁰ The share gain of the median voter from redistribution is measured in his model by the change in the gross income of the sixth pre-tax income decile as a result of taxes and transfers.

electoral systems, one cannot expect that the median voter's preferences prevail in determining the social policy outcomes.

2.2.2 The class alliances framework

Following the introduction of the Meltzer-Richard median voter theory, a group of scholars sought to apply the rationale of this theory to a comparison between majoritarian and proportional electoral systems. The most developed model of this kind was presented by Iversen and Soskice (2006). They tried to explain the difference in the level of income inequality under different electoral institutions by assessing the chance of Left parties to be in government. In more recent literature this came to be known as the *government partisanship approach* as opposed to another line of theorisation offered by Persson, Roland and Tabellini, which is known as the *centre of political gravity* approach. As Soskice and Iversen's model is the most elaborated and well established one using the class alliances framework, we spend a few pages to expound the model and its implications.

Iversen and Soskice hypothesise a society with low, middle and high income classes of voters all being of equal size. Their argument is that under majoritarian rules, middle class voters maximise their economic gain by voting more often for the party primarily representing the high income class, whereas in proportional democracies, the middle class party will find itself better-off when forging a government coalition with the party representing the lower class and demanding a transfer from the high income class.

To construct their model, Soskice and Iversen first made a series of assumptions that are in many ways weaker than the assumptions of the Meltzer-Richard model, making their model more realistic and more robust. These assumptions include:

1. Every individual in society belongs to one of three classes: lower (**L**), middle (**M**) and higher (**H**), based on income.¹¹
2. Voters are not economically mobile; i.e. they will not move from one class to another.
3. The tax system is overall progressive and the redistribution is overall non-regressive; i.e. the middle class cannot gain more than the lower class, and the upper class cannot gain more than the middle class.¹² If the net payment to class j is shown as P^j then this assumption may be shown as: $P^H \leq P^M \leq P^L$.
4. A balanced budget.

They also make the following assumptions regarding the nature of party representation:

5. Each electoral system is associated with a distinct party system.
6. If coalitions are needed to form government, they consist of two parties.
7. Under the proportional rules, parties are perfect representatives of their constituent classes, and under the majoritarian rules, parties represent the vote of neighbouring classes.
8. Parties tend to commit credibly to electoral platforms that reflect the preferences of their core constituencies but are likely to default on their announced commitments to

¹¹ This denotes economic well-being, although Soskice and Iversen do not state as such.

¹² They make this assumption solely based on empirical evidence in Western democracies in the period under investigation.

the interests of other classes who voted for them (under the majoritarian system) or their coalition partner (under the proportional system).

They interpret redistributive politics as the outcome of class coalitions in forming the government where exclusion from government comes at a price. During an election, each class of voters (J) seeks to maximise its net payment (P^J), which is the sum of the voters' benefits (B^J) minus their taxes (T^J): $P^J = B^J - T^J$.

Every class has an optimal policy with regards to redistribution. **L** prefers maximum taxation of **M** and **H**, and keeping all receipts. **M** would opt for maximum taxation of **H** and the sharing of revenue equally with **L** (given the non-regressivity condition), and **H**'s ideal is zero taxation/redistribution. While the interests of **H** and **L** are conflicting and mutually exclusive, **M** has the opportunity to be the kingmaker to maximise its gain based on the possibilities that the electoral system offers.

Under the proportional system, parties enter into coalition formation dynamics on behalf of their respective classes because each class is free to choose its exclusive representative party. The non-regressivity assumption about the welfare system implicitly rules out a coalition between **H** and **L** to tax **M** and distribute the proceeds, or between **M** and **H** to tax **L** and distribute the proceeds (Lupu and Pontusson 2008).

Under a majoritarian system, where there are only two parties, only higher and lower classes have parties that by and large represent their interest. The middle class voters have to do their cost/benefit calculus to choose which of the two parties to vote for.

The following presents how the theory explains government partisanship under different electoral rules:

A. Under the majoritarian rule

In the absence of salient cross-cutting cleavages like the ethnic divide (as say in Quebec or Scotland), Duverger Law predicts that the party system would reduce to two rival parliamentary parties (Duverger 2003). Under such a set-up, the middle class voter has to choose to vote either for the party that predominantly represents the higher class, or the one that predominantly represents the lower class. So in order to win a majority, both parties seek to appeal to the middle class voters in their electoral platforms because their natural constituencies have no other choice but to vote for them. As a result, the party system under majoritarian rules is composed of a *lm* and a *mh* party. Soskice and Iversen argue that it is always likely that after the election, either party would default on their electoral platform and implement policies that favour their natural constituencies (**L** and **H** respectively). In every election, **M** has to vote strategically and will face three scenarios as listed in table 2.1.

Table 2.1

The distributional outcome of entering into coalition for the middle class under the majoritarian rules in the class alliance theory

Scenario	Happens when	Policy vector under different scenarios			Priority for the middle class
		p^L	p^M	p^H	
1	lm or mh is moderate and loyal to its electoral platform	$\frac{1}{2} T^H$	$\frac{1}{2} T^H$	$-T^H$	1
2	mh defects to the right	0	0	0	2
3	lm defects to the left	$T^M + T^H$	$-T^M$	$-T^H$	3

Source: Iversen and Soskice 2006

The most favourable option for the middle class is to form a coalition with the lower class to tax the upper class and evenly split the proceeds between themselves (scenario 1). However, there is a chance that the **lm** party under a leftist leadership would choose to renege on its election promise to the middle class, tax both **H** and **M**, and redistribute the entire proceeds to the **L** class (scenario 3). This is the worst outcome for middle class voters. The probabilities of a left turn by the **lm** party (π_{lm}) and a right turn by the **mh** party (π_{mh}) are evaluated by the **M** class voters based on the proposed candidates for the leadership of the parties upon each election. If voters perceive a default by the **lm** as a credible threat, they choose to vote for the **mh** party, which naturally views zero redistribution as its profit-maximising choice (scenario 2). This alternative is not as advantageous as the first option for the middle class, but at least it is not as detrimental to voters' interests from this class compared to scenario 3. In light of this interpretation, Soskice and Iversen offer a mathematical proof in their paper for the proposition that the chance of **M** voting for **mh** (Π_{mh}) may be shown by a formula (2.1) that is always greater than 0.5:

$$\Pi_{mh} = \frac{1}{2} + \frac{1}{2} \frac{T_M}{T_M + \frac{T_H}{2}} \quad (2.1)$$

As a result, the majoritarian system has a bias towards right-wing government formation. An intuitive explanation of this formula is as follows: on the right hand of equation (2.1), $(\frac{1}{2})$ denotes the possibility of **M** voting for the **mh** coalition when T_M is equal to zero. In other words, when the likely loss from an **lm** coalition is perceived to be zero to middle class voters, they are indifferent to either **mh** or **lm** and will vote **mh** half of the time. The second right-hand term $(\frac{1}{2} \frac{T_M}{T_M + \frac{T_H}{2}})$ indicates that with growth in T_M , the likelihood of **M** voters avoiding the **lm** and voting for **mh** approaches 1.

Under such circumstances, in conventional theories (explained in section 2.3), parties gravitate towards an equilibrium electoral proposal to appease the middle class voters. Instead, Iversen and Soskice's theory is not an equilibrium theory. It rules out the ability of parties to reposition their electoral agenda based on what they learn from middle class voters' assessment of the parties' likelihood of defection from electoral promises once elected (i.e. π_{lm} and π_{mh}). This implies that parties cannot absorb feedback to control their leaders from acting against the interest of their core constituencies.

B. Under the proportional rules

Under the proportional rules, parties are representative, and will not deviate from the preferences of their constituencies; accordingly, voters vote sincerely and not tactically. Here, forming government requires a post-election coalition. According to Iversen and Soskice, the pay-off vector of different possible coalitions is as per table 2.2, and the middle class party will always choose to enter into a coalition with the lower class. Their work is somewhat contradictory as to whether the **lm** coalition is always the case or only more frequent. Iversen and Soskice also maintain that even if the formateur¹³ is not **m**, results would still be the same. Although they offer a mathematical proof for this claim, they are not very clear with some of their notation and numerical assumptions in the paper.

Table 2.2

The distributional outcome of entering into coalition for the middle class under the proportional rule in the class alliance theory

Scenario	Happens when	Policy vector under different scenarios			Priority for the middle class
		p^L	p^M	p^H	
1	lm is in power	$\frac{T_H + T_M}{2}$	$\frac{T_H - T_M}{2}$	$-T_H$	1
2	hm is in power	$\frac{T_H - T_M}{3}$	$\frac{T_H - T_M}{3}$	$-\frac{2}{3}(T_H - T_M)$	2
3	lh is in power and $T_M > \frac{T_H}{3}$	$\frac{2T_H}{3}$	$\frac{-T_H}{3}$	$\frac{-T_H}{3}$	3
4	lh is in power and $T_M \leq \frac{T_H}{3}$	$\frac{T_M + T_H}{2}$	$-T_M$	$-\frac{T_H - T_M}{2}$	4

Source: Iversen and Soskice 2006

Two underlying realities make this outcome possible under the proportional system. First, the **m** party always has the chance to turn to the opposition party to negotiate a coalition deal. This credible threat holds their coalition party accountable to the coalition agreement and protects the middle class from being soaked by either of the other two classes. Second, the policy outcomes of the table above result from the fact that any coalition between **m** and **l** implies splitting the total taxable pie between themselves, whereas a coalition between **m** and **h** means that they have to share the pie with **l** to ensure non-regressivity.

In summation, the implication of Iversen and Soskice's model is that in the absence of other factors interfering with the election outcome, the left coalition is more frequent under the proportional system and the right coalition under the majoritarian system, an outcome indicative of a higher average redistribution level in proportional democracies.

The Iversen-Soskice model is an interesting account of the voting dynamics in a class society. At the same time, it can be criticised on several grounds. On the one hand, the division of people into classes of equal size and single-dimensional and relatively coherent interests is simplistic and problematic. The assumption of uni-dimensionality, which is chronic in several of the

¹³ A party nominated to form government.

theories and researches that are reviewed in this chapter, equates economic policy with the question of redistribution. It fails to take into account that economic policy also affects the market income of the classes as well. This negligence results in offering deterministic explanations, especially of the mechanics of the proportional system, by leaving no room for electoral competition and determining policy outcomes independent of the election results.

On the other hand, the model rules out the possibility of a single-party majority government under the proportional system unless when **M** and **L** are predominantly represented by a cross-class party that exclusively represents these two classes which then begs an explanation for why **L** or **M** might not choose to vote for their separate representative parties. On the empirical side, instances of single-party majority governments are not rare among the countries with proportional electoral systems.

Another major problem with the Iversen-Soskice model is its neglect of the high-income bias of the electoral turnout. This is a well-established fact in the political science literature (see section 2.2.3). Despite the consistently higher turnout rate under the proportional rules, the chance of one refraining from voting is in inverse relation with her economic well-being. This may not necessarily violate the credibility of the Iversen-Soskice model. However, it can have serious ramifications for the theory's capability to explain empirical situations, especially with the recent universal decline in electoral participation rates in Western democracies.

Lupu and Pontusson (2008) add to Iversen and Soskice's proposal a qualitative criterion to predict the level of social spending. According to this criterion, under the majoritarian rules, the condition for **M** voters to join the **L** voters in voting for the **lm** party in demanding more redistribution, is that the average income distance between the middle class and the lower class is small. But unlike Iversen and Soskice, Lupu and Pontusson hold that the position of the median voter relative to the other two classes determines the redistributive outcomes independent of left or right partisanship of the government. In their words, "the association between proportional systems and higher redistribution has to do with the *center of political gravity* rather than the partisan composition of government" (Lupu and Pontusson 2008, 3).

According to Lupu and Pontusson, the effect of the electoral system on redistributive politics is indirect and through its impact on labour market institutions such as unionisation and centralised wage-bargaining arrangements. When the distance between the middle class and the low income class is small, median voter sympathise with the latter group or, alternatively, factors in the possibility of becoming poor in her cost-benefit calculus. Hence, middle class voters are more likely to demand supportive and protective welfare services. Lupu and Pontusson do not elaborate much on the dynamics of their proposed effect. However, their theory seems to tap into more fundamental causes of the difference between the distributive impacts of the electoral systems and is hence more immune to the oversimplifications of the models that seek to reveal direct causalities through the voting dynamics.

The last theory that at least partially fits into this category is proposed by Ticchi and Vindigni (2010). This theory focuses on voters' behaviour when looking at the majoritarian systems, but attributes the fiscal outcomes to the systemic effect of the electoral system when studying the proportional system.

In their proposal, voters are divided into three classes: the poor, the middle class and the rich. Of the three classes, the middle class has the largest number of votes, but less than 50% of the

total votes. The size of the vote of each class in their model determines its bargaining power in coalition building under the proportional system. Similar to Iversen and Soskice, voting in this model is assumed to be sincere under proportionality, but tactical under the majoritarian rules. The tax rate is flat and the public good is only allocated to the groups represented in the government. Ticchi and Vindigini argue that the level of taxation is higher under majoritarian rules because under this system always only the rich class representative wins office. Their argument about the majoritarian system is stronger than that of Iversen and Soskice, who more realistically assume two-party competition and more cautiously argue only for a greater likelihood of right-wing governments to be in office. Ticchi and Vindigini put forward the following argument as proof of their claim:

“If the rich candidate runs for office no one else would run. Because if a middle class agent also runs, he would be defeated by the rich candidate because both the rich and the poor would vote for the rich. The poor find it convenient to vote for the rich candidate because in their eyes he is the less bad of the two of them: he offers to the poor none of their preferred public good but demands lower taxes. Similarly, if a poor agent runs for office against a rich candidate, he would be defeated by the vote of the middle class and the rich. Lastly, it cannot be the case that a candidate from each group runs for office. Indeed, the middle class candidate would win the election with certainty in that instance (because the size of the middle class vote is the largest), and therefore neither a poor nor a rich candidate would run against him” (Ticchi and Vindigini 2010, 33).

This argument is problematic in at least two ways. First, the reason they believe that the poor prefer a rich government to a middle-class government is that they assume in their model that only the class represented in government will receive the public good. This is at odds with the non-regressivity assumption as explained previously. In reality it is reasonable to assume that any level of redistribution to the middle class should be followed by at least the same level of spending for the lower class, even when their party does not participate in the government.

Second, Ticchi and Vindigini fail to realise that if no candidate from the lower and middle classes run, then a meaningful election should involve at least two rich candidates, which opens the door to a split of the vote between voters. Being aware of this possibility, candidates from other classes would also be inclined to run and this will change the electoral landscape and possible outcomes.

Under the proportional system, subject to the bargaining power of the poor, a coalition between the poor and another class wins power most of the times. And when this is not the case, and a coalition between the rich and the middle class wins government, it is still less rich than a unitary government by the rich, as is the case under the majoritarian system. Therefore, Ticchi and Vindigini conclude that the difference in the composition of government results in a unanimously lower tax rate under the majoritarian system corresponding with lower social spending.

2.2.3 Class bias of electoral turnout and economic inequality

The claim that a higher electoral turnout is associated with more economic redistribution or higher economic equality seems to have broad acceptance among the political economists (see for example Hicks and Swank 1992; Fumagalli and Narciso 2012).¹⁴ The class-bias theory seeks to offer a causal mechanism for this dynamic, as well as linking it to another literature regarding

¹⁴ See Fineraas 2007 for a counter-argument.

the impact of the electoral institutions on the rate of turnout. In its broad formulation, the theory maintains that in political democracies, the proportionality of an electoral system boosts the electoral turnout, and greater electoral participation is associated with lower income inequality (Dye 1979; Pampel and Williamson 1989; Hill et al. 1995; Mahler 2008).

Empirically, evidence in support of this theory is more abundant among the established and economically-developed democracies. But when looking at developing democracies, especially in Latin America, this argument does not withstand the observation. The detailed formulation of this hypothesis is straightforward and consists of five proposed causal relations in its chain of causality, as illustrated in figure 2.1.

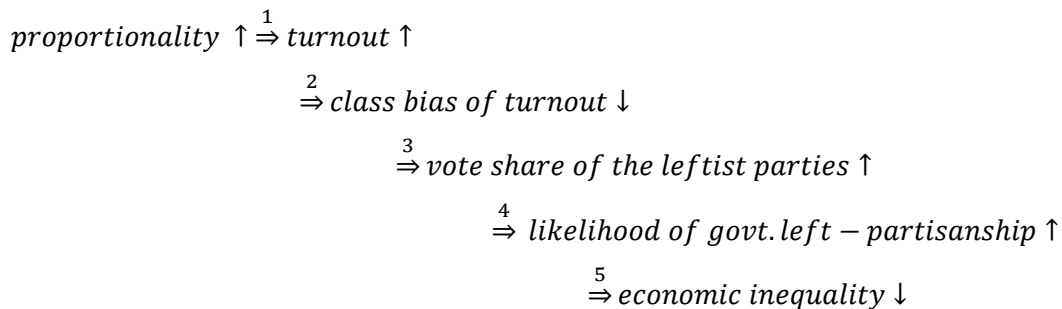


Figure 2.1

The chain of causality in ‘the class bias of electoral turnout’ argument

First, proportional systems tend to minimise the size of wasted votes¹⁵ and promote more competitive and nationwide electoral mobilisation by parties during the elections. This, in turn, boosts the rate of electoral turnout (Powell 1986; Jackman 1987; Blais and Carty 1990; Jackman and Miller 1995; Franklin 1996; Radcliff and Davis 2000; Kostadinova 2003; Selb 2009). So, in short, proportional electoral systems are associated with higher rate of electoral turnout.

Second, “the class-bias of the turnout” is inversely related to the rate of turnout.¹⁶ This argument is presented by a numerical example in figure 2.2. It is widely accepted among social scientists that income and other manifestations of social stratification, such as education and social status are positively related to one’s likelihood of participation in the elections. In other words, empirical data shows that lower income classes have a lower rate of electoral turnout (Gosnell 1927; Tingsten 1937; Lipset 1960; Berelson and Steiner 1964; Sarlvik and Crewe 1983; Powell, Jr. 1986; Dalton 1996; Franzese 2001; Boix 2003; Gallego 2010)¹⁷. In the jargon of political science, this observation is known as “*the income bias*” or “*the class bias of the turnout*”.

¹⁵ Votes cast for losing candidates or for candidates that win with big majorities (Lijphart 1997).

¹⁶ The class bias of the turnout is also shown to be directly affected by the simplicity of the electoral system. (Lijphart 1997; Linder 2010, 113)

¹⁷ See Lijphart (1997) for more references.

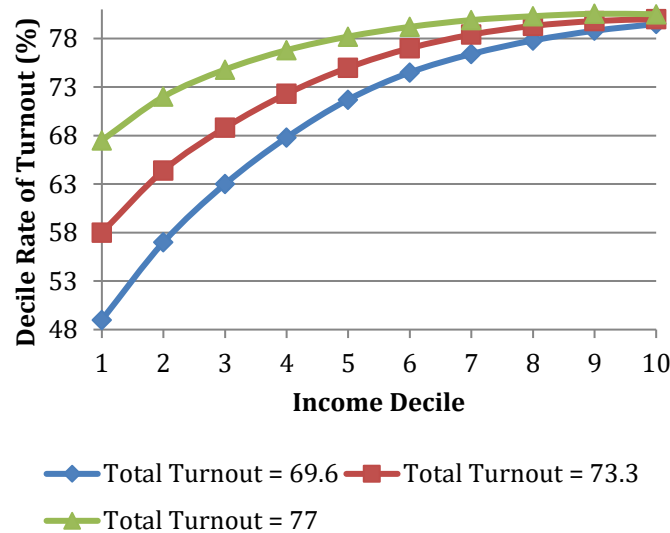


Figure 2.2

An illustration of the sensitivity of the class rate of electoral turnout with respect to the overall incentive for voting (shown by the total rate of turnout)

Third, poorer voters are more likely to be pro-redistribution than the other classes, and they are more likely to vote for left-of-centre parties (Franko, Kelly and Witko 2016).

Fourth, the rate of electoral participation of low income citizens is positively associated with the left-partisanship of government. This implies that the chance of left-of-centre parties to win office increases with the increase in the number of low-income (i.e. more pro-redistribution) voters (McAllister 1986).¹⁸

Finally, the fifth causal proposition asserts that left-of-centre governments are more inclined to redistribute and reduce the level of economic inequality than centrist or right-of-centre governments. This last chain of causation is common between the turnout-inequality theory and the government partisanship assumption in the class alliance theory introduced in the previous section.

Apart from the fact that empirical evidence for the class-theory of inequality only confirms that in the more developed countries, and in certain geographical areas of the world, at least two other shortcomings may be enumerated for this theory.

The first problem concerns the lack of theoretical elaboration. The argument that the class-bias of turnout is a negative function of the overall rate of turnout is the prime nexus in the class-bias theory of economic inequality. This claim has been made based on empirical observations in the works of Piven and Cloward (1988), Abramson (1995), Sidjanski (1983), Seligson et al. (1995), Gallego (2010), Linder (2010) and Carey and Horiuchi (2013). However, although explanations for why lower education or social status would suppress electoral participation are abundant in the literature, we couldn't find any theoretical model to explain why this phenomenon is itself

¹⁸ Finseraas (2007) turns around the second argument and shows that it is not the income bias of the turnout that is associated with support for economic redistribution. Rather, a higher turnout implies higher proportion of pro-redistribution voters (regardless of their income class).

an inverse function of the overall rate of turnout.¹⁹ Perhaps Gallego (2010) gets close to an explanation when she writes:

“Logically, when almost everyone votes, little room is allowed for inequalities to emerge; thus, raising overall turnout rates is an effective way of reducing inequalities in voter participation.” (Gallego 2010, 246)

This quote might imply that because there are always more people to vote among the poorer class, an increase in the overall rate of turnout is more likely to be the result of more poor people voting in an election. As Gallego contends, this might be true for boundary conditions when the turnout approaches 100%. Nonetheless, a majority of real life electoral outcomes are far below this boundary condition, and variation in the rate of turnout of other classes can always be sufficient to change the overall turnout a few percentage points (Finseraas 2007).

In fact, if the rate of turnout and its class composition are interrelated, then a proper theory of the political economy of the electoral systems must be able to explain the impact of the institutional factors on the level of turnout; only such a theory would be able to reveal why the median voter shifts to the left (or right) when more (or less) people choose to vote. As Nagler and Leighley rightly assert:

“Poor people might vote more (or less) based on the nature of government policy, e.g., eliminating “welfare as we know it,” or implementing tax cuts for the rich, or the poor may be increasingly distracted from political involvement as they confront the challenges of economic adversity”. (Nagler and Leighley 2007, 10)

This statement implies that the effect of electoral institutions on the class bias of the turnout (if at all) must be mediated through its impact on the policy proposals on offer in elections, which itself reflects the impact of these institutions on the structure of the party system and political competition.

Also, related to the second causal mechanism claimed by the bias theory, it has been shown that the relationship between the rate of the turnout and the bias of the turnout may be more complex and nonlinear than to be explained by a linear theory. Looking at New Zealand’s electoral outcomes between 1990 and 2011, Aminnaseri and Mooi-Reci (2014) found that although a reduction in class-bias is linked to a greater chance of left-governments being in power and lower income inequality, still, decrease in the class-bias of the turnout may accompany a decrease in the rate of the turnout. As is shown by figure 2.3, a drop (/increase) in electoral turnout in the 2002 (/2005) election coincided with a drop (/increase) in the class-bias of the turnout. On the other hand, a reduced turnout in 1999 had no effect on the class-bias of the turnout. Aminnaseri and Mooi-Reci concluded that the pattern of party mobilisation and competition may be as important in determining the relative difference in the electoral mobilisation of social classes as the aggregate level of political mobilisation in elections.

¹⁹ Franzese (2001, 7) submits to this interpretation too.

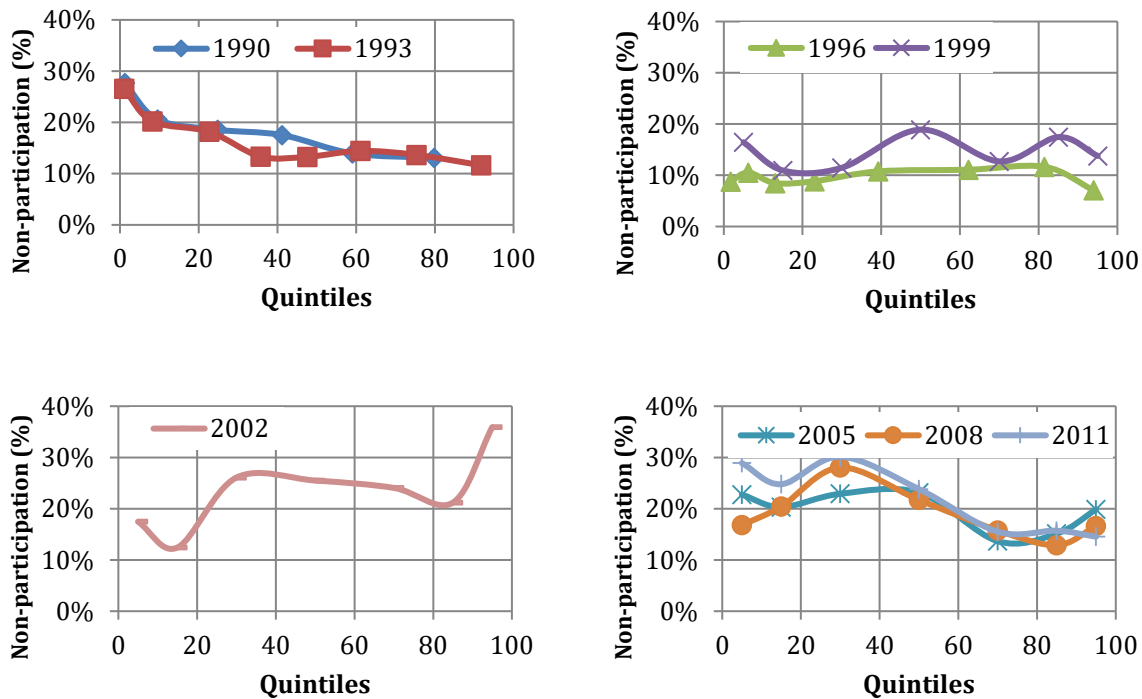


Figure 2.3

Comparing different patterns of income composition among non-voters for New Zealand general elections 1990-2011

Note: Overall Rates of turnout were 1990:85.2, 1993:85.2, 1996:88.3, 1999:84.8, 2002:77.0, 2005:80.3, 2008:79.5, 2011:74.2. From Aminnaseri and Mooi-Reci (2014)

On a side note, it is worth mentioning that the question of interaction between the electoral turnout and economic inequality has been studied from the opposite standpoint as well; i.e. some scholars have argued that the level of economic inequality can be a determinant of electoral turnout, albeit in an inverse manner (Verba and Nie 1972; Lijphart 1997; Schattschneider 1960; Jaime-Castillo 2009; Solt 2010).²⁰

²⁰ Different studies deal with more delicate aspects of this relationship?? and the different mechanisms through which the chain of causation is formed. Lister (2007) focuses on the type of welfare system (universalist vs. targeted) and considers norms and values to be the intermediary factors between inequality and participation. Lister argues that the historic impact of universalistic welfare states has been to create a solidaristic and egalitarian value system that ushers in a higher demand for redistribution through government and hence lowers inequality. Simultaneously, lowering inequality in turn leads to consolidations of the egalitarian value system and welfare institutions in society.

Some other studies that are usually grouped together as resource theories focus on the difference in access to resources among the poor and the rich for manipulation of the political agenda and institutions (Glaeser, Scheinkman and Shleifer 2003). Solt (2010) found that higher levels of income inequality strongly depress the interest in politics, the frequency of political discussion, and participation in elections among all but the most affluent citizens. Horn (2011) asserts that the impact of inequality on turnout is conditioned on the location of the largest gap in distribution. Through studying several European democracies, Horn proposes that turnout is depressed when inequality is high between the very rich and the middle class, whereas it increases, instead, when at the same level of inequality the gap is formed between the lower and the middle classes. A conclusion that could be drawn about this approach is the inadequacy of measures such as the Gini index (that are insensitive to the shape of the distribution at the two tails) to study the relationship between turnout and inequality. A direct reference

2.3 Theories modelling politicians' and parties' behaviour

The second class of theories attempts to explain the level of taxes and transfers by looking at parties strategies to maximise their share of political power, both in parliament, and more importantly, when in government. In this section, we introduce four theoretical approaches to modelling the vote maximising and power sharing decisions of politicians and parties. These include the universalistic decision-making theory, geographic-targetability approach, the coalition effect approach, and the consumer-producer framework.

2.3.1 The universalistic decision-making theory

This theory has a simple logic: it basically maintains that an increase in the number of represented parties in parliament would increase the size of government spending due to a phenomenon known as 'universalism'.

As neat and clear as it might sound in the first instance, this is the trickiest and least cohesive of the four arguments that have been put forward to explain the level of social spending/inequality with reference to the behaviour of political representatives. Due to the fact that the theory in its most articulate form has been built on the concepts developed in some prior studies, this study takes a chronological approach in reviewing the evolution of the argument. Figure 2.4 gives a summary of the development of the coalition size theory.

Weingast (1979): in majoritarian electoral systems, uncertainty over re-election leads to "universalistic" decision making over matters of spending and redistribution

Weingast, Shepsle, Johnsen (1981): universalism in majoritarian systems increases the level of government spending on 'public goods' beyond efficiency

Inman and Fitts (1990): while under the majoritarian electoral system, universalism increases social spending on public goods, there is a natural limit to the level of spending defined by the size of the ruling coalition, the role of the political parties and the veto power of the presidents (where they exist). This natural limit is still above the efficient level of spending

Scartascini and Crain (2002), Mukherjee (2003): universalistic decision making, that has been so far used in the context of individual legislators in majoritarian systems, is applicable to the behaviour of the parties as well. "when the effective number of parties represented in a multiparty legislature increases, government spending on public goods will decline but expenditure on subsidies and transfers will increase", and this "will lead to an increase in central government expenditure as a share of GDP or, in other words, the size of government." This is due to the mechanism known as "universalism" but at the party level.

Figure 2.4

The chronological development of the 'Universalistic decision making' theory

to this argument can be found in Jaime-Castillo (2010). Finally, there are a few studies that suggest to the contrary. See for example Scruggs and Stockemer (2009).

The coalition size theory has its roots in attempts by Weingast (1979), and Shepsle and Weingast (1981), to explain the high level (in their view) of public spending under the majoritarian electoral system of the United States by looking at the size of Congress. Key to Weingast's analysis is the notion of 'universalism'.

Weingast (1979) offers a model of public spending for a unicameral legislature with majoritarian electoral rules where parties play no role in forming parliamentary politics. Rather, in his model, policy outcomes are the result of rational choices made by individual office-seeking MPs who engage in cooperative games with their peers in order to maximise their chance of re-election.

In discussing public finance, Weingast distinguishes between two forms of government spending. One, which he calls 'distributive spending' which can concentrate benefits in certain geographical areas (such as electoral districts) while spreading the costs through general taxation to other areas. This type of spending, which in the modern jargon of political science is known as 'targeted spending', mainly includes local infrastructure projects such as a hospital, a bridge etc.

The second type of government spending includes benefits that are non-exclusive and have to be provided to all citizens or large subsections of the population irrespective of their residence location. Defence, R&D, tariffs and social welfare programs such as pensions and family benefits are a few examples. Weingast refers to this category as 'public goods' yet a more contemporary term to name such items in the government expenditure is 'universal spending'.

In most developed nations today, universal goods comprise a bigger portion of the public spending, whereas in developing countries where the coverage of welfare services is still rudimentary, targeted spending is more likely to prevail on government balance sheets.

Noticeably, from the outset, the line of argumentation that we are introducing here was solely focused on politicians' incentives for setting the level of targeted spending and was completely blind to the level of universal spending.

In his 1979 work, Weingast challenged the common idea that legislators seek to form a 'Minimum Winning Coalition' (MWC) in parliament (i.e. a bare majority of 50%+1 MPs) to pass their intended legislations on redistributive matters. The MWC theory maintains that this coalition takes form because by maximising the size of the minority, the coalition members can maximise the per capita gains for the winners' constituencies at the expense of the minority's constituencies. Instead, Weingast (along with other scholars) argued that legislators "seek unanimity and are reluctant to exclude minorities from the benefits of distributive legislation" (Weingast 1979, 245). This is what he refers to as the norm of universalism, formally defined as "the tendency to seek unanimous passage of distributive programs through inclusion of a project for all legislators who want one" (Weingast 1979, 249).

In proving the norm of universalism Weingast makes the following assumptions:

1. MPs are rational and office-seeking.
2. Voters are rational and profit-maximising, and re-elect a representative who offers the most beneficial projects to their electoral constituency (retrospective and sincere voting).

3. In making their voting decisions, voters do not consider the effect of the benefits they receive from other districts.
4. A flat taxation regime that evenly distributes the total costs of (targeted) spending among electoral districts, which are made up of relatively equal populations (tax base) under the majoritarian electoral system.
5. A taxation mechanism that restricts the possibilities for side payments (e.g. bribery).
6. A single-dimension decision model where the only issue at stake is the level of taxation and the level and geographical distribution of government expenditures.

Weingast claims that all MPs find it in their best interest to join a universal coalition rather than a minimum winning coalition because a universal coalition would maximise the level of benefits they can bring to their constituencies and hence maximise their chance of re-election. He also argues that MPs would opt for a universal coalition because it reduces the uncertainty surrounding the membership in a MWC as well as the time and energy required for negotiating such a coalition.

Thus, Weingast argues that “the equilibrium strategy is a project for every district as long as one can be found that provides benefits exceeding $1/N^{\text{th}}$ ²¹ of the [total government] costs” (Weingast 1979, 253). However, one issue regarding these notions of benefit and cost that are introduced to build a parametric model is that while the cost of a project has a material and monetary value, its benefit is the subjective utility that it would produce among the voters. In the real world, even if quantifiable, these two are not comparable as such due to unit inconsistency. Further, it is not clear how the existence of projects with costs and benefits both equal to $1/N^{\text{th}}$ of the budget can be guaranteed for each electoral district. In many instances the costs of local expenditure (such as in natural emergencies) may exceed the $1/N^{\text{th}}$ average.

Another clear deficiency in this modelling approach is that, in effect, when Weingast seeks to prove the higher individual payoff of universalism compared to MWC for representatives, he takes an all-encompassing coalition (equal to the size of the legislature) as the definition of universalism, something that is not only unrealistic, but also in violation of his own definition of universalism as involving “the inclusion of a project for all legislators who want one” (Weingast 1979, 249).

Further, as mentioned before, Weingast’s model is indifferent to the role of the parties in parliamentary politics. This theory fails to explain why in the presence of a party framework for policy making, parties with a majority should embrace a universal coalition with their ideological adversaries when they are in fact elected (in part) to represent the conflict of interests in our class societies. By assuming that any project of extra spending in an electoral district will please all voters in the district, the theory is in full denial of the conflictual nature of politics, especially in bi-party systems, which clearly correspond with majoritarian electoral rules. Given that each district is divided between supporters of different parties, party-associated politicians do not benefit from alienating their own base, even in districts where the party base constitutes a local minority; because according to Weingast’s model, all candidates would compete over projects that would at least benefit a majority of the voters. This implies that all that matters to electoral agenda setting in each district, and for all candidates, is the demographic composition of the district, and all candidates would compete to serve the

²¹ N is the size of the legislature.

interests of the local majority group. But doing so would predictably create political costs and hurt the collective reputation of the party as advocates of certain social interests/groups. This is true for the swing constituencies as much as elsewhere because alienating a party's own constituency is politically costly for the universal saleability of all candidates associated with the party in all constituencies.

Last but not least, the theory is clearly in defiance of the empirical evidence. Most often, in democracies, bills related to matters of taxation and transfers are passed with only a narrow margin in legislature. Also, the taxation scheme is not flat, but progressive, having important implications for the fundamental assumptions of the model.

Building on Weingast's 1979 article, Weingast, Shepsle and Johnsen (1981) tried to show that Weingast's model of universalistic coalition decision-making would lead to a higher-than-efficient level of taxation and expenditure.

The three scholars maintained that there is an economically efficient level of government spending²² marked by the maximand equation:

$$E(x) = B(x) - C(x) \quad (2.2)$$

Where x is the total size of all local projects, $E(x)$ is the overall efficiency of the government spending in a country, and $B(x)$ and $C(x)$ are the total benefits and total costs of these projects in all districts respectively:

$$B(x) = \sum_{j=1}^{districts} b(x_j), \quad C(x) = \sum_{j=1}^{districts} c(x_j) \quad (2.3)$$

Here, it is assumed that change in the costs of the projects follows a linear pattern, whereas benefits show a diminishing return; i.e. doubling the magnitude of a project offered to the voters in a district increases their utility and probability to vote by less than twice.

The level of projects that represents this optimum point is shown as x^E in figure 2.5, which is the point where $E(x)$ is at its peak, or its first order derivative is zero and the second order derivative is negative. Weingast et al. then try to show that the decision calculus of the politicians determines project sizes that result in an overall expenditure greater than x^E . At the core of their proposal is the idea that inefficiency in expenditure is the result of political institutional design (here, electoral districting and collective decision-making in parliament) in transforming economic cost-benefit calculations by the decision makers into a political calculation marred by considerations of office-seeking. They call this phenomenon the 'politicisation of expenditures'.

²² Weingast et al. do not offer a definitive conceptualisation for economic inefficiency and simply explain it as "too much government expenditure".

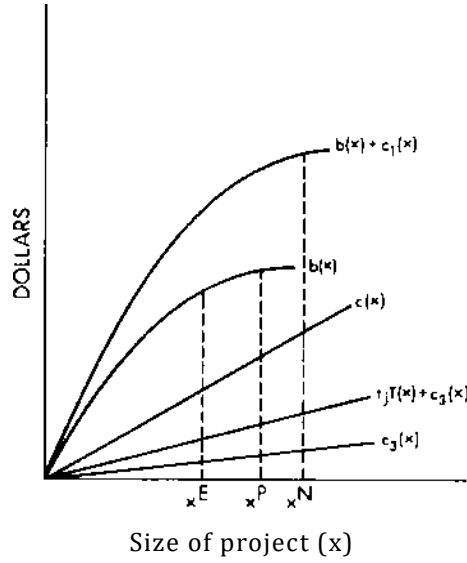


Figure 2.5
Cost-benefit calculus of individual MPs under
the majoritarian system (from Weingast et al. 1981)

In proving their claim, Weingast et al. divide the total costs of a local basket of projects $c(x_j)$ into local expenditure in a district shown as $c_1(\cdot)$, expenditure outside the district shown as $c_2(\cdot)$, and externalities, which fall on the district such as damage to the environment, shown as $c_3(\cdot)$.

They assume that “local gains and losses are politically more significant to the legislator’s objectives (re-election and constituency service) than non-local effects” (Weingast et al. 1981, 648). In other words, they tend to internalise $b(x_j)$ and $c_1(x_j)$, but not $c_2(x_j)$ and $c_3(x_j)$. This is because $c_1(x_j)$ is a budget that is locally invested to finance a project and hence benefits the locals: owners of the means of production by receiving more orders for productions and consumers in the form of higher purchasing power due to the effect of investment and job creation.

If there was only a single constituency in a country ($N=1$), both $c_1(x_j)$ and $c_2(x_j)$ would be invested inside the district, and the maximand equation (the equation that politicians seek to maximise in their calculus) would be:

$$\begin{aligned} \max_x & ([b(x_j) + c_1(x_j) + c_2(x_j)] - [c_1(x_j) + c_2(x_j) + c_3(x_j)]) \\ & = \max_x (b(x_j) - c_3(x_j)) \end{aligned} \quad (2.3)$$

Since $c_3(x_j)$ is only a fraction of $c(x_j)$, the project scope that maximises the maximand equation is greater than x^E and is shown as x^P in figure 2.5.

But when there are multiple single-member districts in an electoral system with the universalist norm of decision making, MPs cannot internalise part of the costs associated with projects. The maximand equation faced by each MP to maximise may be shown as:

$$\max_x ([b(x) + c_1(x)] - [t_i T(x) + c_3(x)]) \quad (2.4)$$

Where $t_i T(x)$ is the share of the district i from the total tax burden. They call the answer to

equation x^N and claim (and mathematically prove) that “in a wide set of circumstances $x^N > x^P$ ” (Weingast et al. 1981, 652). In other words, distributed decision-making fails to internalise the true cost of their projects for each legislator because part of the cost of the projects is in the form of consumption in the non-local districts from which voters of the district do not directly benefit.

By “a wide set of circumstances”, Weingast et al. are referring to the situation where “in district-initiated projects, [share of the] locally earmarked expenditures grow more rapidly with project scale than local taxes.”²³ This may be expressed algebraically as:

$$\frac{\frac{dc_1(x_j)}{dx_j}}{\frac{dc_1(x_j)}{dx_j} + \frac{dc_2(x_j)}{dx_j}} > t_j \quad (2.5)$$

Weingast, Shepsle and Johnsen call it a weak condition because in their view “only a modicum of imagination by legislators is required to find projects with this local expenditure characteristic” (Weingast et al. 1981, 653).

This is a very important inference and one from which they derive the well-known ‘law of 1/N’ as a corollary. *This hypothesis indicates that when* district tax share (t_j) *is a declining function of the number of districts (i.e. $t_j = \frac{1}{N}$), –for example, when the tax burden is proportionally distributed among the electoral districts, then the degree of inefficiency in the project scale ($x^N - x^E$) increases with the number of districts; this means that an increase in the scale of local projects would allow the local legislators to externalise a larger proportion of the costs from their calculus and, hence, make economically-less-efficient choices of the scale of the projects.*

Weingast et al. then ask whether there is an upper limit for the level of inefficiency in public spending decided under a distributed and localised legislative model. They show that the best achievable scale is x^P achieved when there is only a single district. They also show that there exists a package of compensations that, once offered to the legislators, would make them prefer such equilibrium, not only to x^N , but to any other omnibus of projects. Yet they admit that “there are several ways in which this may fail to hold”. (Weingast, Shepsle and Johnsen 1981, 565)

Like Weingast (1979), this research suffers from all of the enumerated shortcomings related to the “universalism” hypothesis. Beyond that, Weingast et al.’s distinction between an economically efficient level of spending and the outcome of unitary decision-making is at best very ambiguous and somewhat arbitrary. The idea that even under unitary decision-making, the outcome (x^P) is inefficient, amounts to claiming that no political decision-making for a country’s public finance can be efficient regardless of the decision rules; and politicians always overspend. If this claim is true it would remove the need for hypothesising a x^E level of expenditure in the first place because the whole debate is obviously embedded in the context of democratic decision-making institutions, and not a hypothetical abstract level of efficiency that politicians can never agree on.

Some primitive incarnations of what Mukharjee (2003) later developed into a full theory of difference in the spending between countries adopting proportional and majoritarian electoral rules, may already be observed in Weingast, Shepsle and Johnsen’s work of 1981. The single constituency condition they discuss in their paper with a project size x^P , which makes more

²³ For proof refer to the original paper.

efficient decisions regarding the size of the public expenditure, resembles a purely proportional single-district electoral system in which all of the costs of the project expenditure are internalised in the political decision-making. What they propose is that the smaller the size of the constituencies and the larger their number, the higher would be the level of over-expenditure. The problem, however, is that neither claim is confirmed by the empirical evidence. It has been a known fact for a long time that the size of the parliament has no impact on the level of targeted expenditure.²⁴ Neither are we aware of any research suggesting a statistical relationship between the average district magnitude and the size of geographically-targeted spending.

Proportional systems are predominantly associated with a larger public sector as opposed to majoritarian systems. In fact, while rejecting this observation in their main argument, Weingast et al. implicitly approve of this fact when dealing with multi-district public goods (examples of which could be universal welfare services). They confirm that “consequently, multi-district public goods (in the economic sense) are likely under-produced by a [majoritarian] representative legislature” (Weingast, Shepsle and Johnsen 1981, 662).

Utilizing Weingast’s and Weingast et al.’s theoretical foundation for universalistic decision-making, Inman and Fitts (1990) took the argument one step further in two ways: first by trying to offer a more tangible limit to the level of economic inefficiency that resulted from a majoritarian legislature; and second, by incorporating the hitherto absent role of the parties and presidents in constraining public spending.

Inman and Fitts used a modelling design and a set of assumptions very similar to Weingast et al.’s (1981) and concluded that under the norm of universalism and decentralised budgeting, legislators are unable to fully endogenise the costs associated with their local spending proposal. Thus, “the net effect may be a significant overprovision of public projects and tax favours to individual districts, at least relative to what constituents would prefer were they are separately responsible for the full marginal tax costs of expenditures.” (Inman and Fitts 1990, 88)

However, the inefficiency does not go unchecked because eventually excessive spending would put the share of the districts from the national tax burden above the political benefits they receive from this spending. Inman and Fitts introduce the concept of *constrained universalism* whereby each member of the universal coalition only receives projects in which costs are only marginally less than their benefits. In other words, there is a cap on the level of spending under universalism, which is equal to the level of benefits received from geographically-targeted spending, whatever that notion of political benefits would imply.

Inman and Fitts also maintain that this inefficiently large public sector is overly financed by public debt with increase in the size of the assembly because according to the law of $1/N$, an increase in the size of the legislature (N) shortens the fiscal horizon for politicians making debt financing relatively more attractive to tax financing.

²⁴ Primo and Snyder (2008) argue to the contrary and maintain that “in general, the “law of $1/N$ ” need not hold for total government spending, and in fact a “reverse law of $1/N$ ” often holds”. However, it must be admitted that they do not pay attention to the fact that the so called law of $1/N$ does not apply to the total spending, but only to one component of it, which is geographically-targeted spending.

Their second contribution is with regards to the disciplinary role of the parties on their MPs' desired level of spending. Here, Inman and Fitts break with the notion of universalism as a coalition encompassing all members of the parliament (N) and assume a coalition size of M with M varying in the range of $\frac{N}{2} < M < N$. This is indeed fact the true meaning of universalism as was first conceptualised by Weingast in 1979. In the presence of a majority party, the party leadership would be capable of internalising at least part of the costs of its members' expenditure in their decision-making. "Each legislator in the majority internalizes the request for additional dollars ... by recognizing that a dollar more for his or her own project means an additional dollar for all other party members' projects, too." (Inman and Fitts 1990, 93) To the extent that the party leadership succeeds in internalising costs to its members, the total spending of the party members would approach an economically efficient level.

An important aspect of viewing universalism as a 'larger-than-bare-majority coalition' and not an all-encompassing one is the chance to analyse the possibility for the majority to partially export the costs of its local expenditure to tax payers in the minority districts, and indeed, this is incorporated in Inman and Fitts's work. Technically, the majority party can prevent spending in the districts represented by the minority party(ies), but this may be strategically undesirable or even constitutionally illegal. Inman and Fitts postulate that while the 'majority party' members would be allowed to partially externalise the costs of their projects, the majority party would allow the MPs of the minority only to spend on their projects at the level which is economically efficient. Consequently, while the overall local spending in the presence of parties is still above the level of economic efficiency, it is not as far from it as it would have been in the absence of the parties. Inman and Fitts also maintain that by linking generations of politicians through a chain of enforceable within-party agreements, parties "can ensure that the efficient debt policy is sustained from one legislative session to the next."²⁵ This perspective is adopted in an enhanced form in Mukherjee (2003).

Finally, two different studies by Scartascini and Crain (2002) and Mukherjee (2003) utilise the concepts of 'coalition uncertainty', 'constrained universalism' and 'the law of 1/N' to present an argument for the effect of different electoral systems on government social spending. Since the two papers share an identical theoretical model, here we will only focus on elaborating Mukherjee's. To break with the limitations of Weingast's theory and include proportional systems in Mukherjee's synthesis, first he extends the idea of universalism to a multi-party legislature with no party holding the absolute majority, and re-defines it as "the tendency to seek unanimous passage of expenditure programs through inclusion of projects for all political parties that want one" (Mukherjee 2003, 705). Scartascini and Crain (2002) call this revised version of the theory: *modified universalism*.

Mukherjee maintains that an increase in the number of parties would introduce increased uncertainty with regards to the stability of the ruling coalitions. In order to tackle this uncertainty, the optimal choice of parties in the government coalition "will be to include the preferred objects of other political parties in their own budget proposals so as to induce other parties to vote for their proposal" (Mukherjee 2003, 706). Mukherjee goes on to argue that in this way, inclusion of a greater number of represented political parties (with heterogeneous

²⁵ Inman and Fitts also discuss the roles of the presidents in providing fiscal discipline and curbing public locally targeted spending. We do not discuss this here as it is beyond the scope of our discussion regarding the role of the electoral institutions on government spending.

preferences) in the government would increase the number of additional projects that would have to be included in budget proposals by respective party leaders. From this, he draws a parallel with the 'law of $1/N$ ' as used in the majoritarian context and postulates that because a larger legislature is more likely to have a larger number of represented parties, it should be associated with higher government spending.

Reliance on the ideas of uncertainty and universalism in explaining higher government spending in more fragmented legislatures (which is typical in proportional electoral systems) is what distinguishes this model from geographically targeted spending and coalition effect theories that will be elaborated in the ensuing sections. However, such an extension of the idea of 'universalism' to take parties as the new units of analysis is not without problem.

First, Mukherjee implies that no stable ruling coalition is feasible in parliament, which is often not the case. In the original formulation of universalism by Weingast, the whole reason for the ruling coalition to increase its size from a bare mathematically-necessary minimum to universality was the uncertainty caused by the absence of parties and the significance of local spending for re-electability of MPs. While the former condition (i.e. universal coalitions) never holds empirically, the latter is invalid where a proportional system is in place due to the nature of districting in such a system. As such, it is not clear how the universalist mechanism would kick-in in Mukherjee's scenario. Even in a multi-party setting with no party having absolute majority, stable ruling coalitions are often the norm and not the interests of all parties need to be taken into account in decision-making.

Second, even if uncertainty encourages members of the ruling coalition to seek more coalition partners to fend off party defections and coalition breakdowns,²⁶ and if this leads to oversized coalitions, then the prime variables of interest should be the relative size of the ruling coalition, coalition volatility and the likelihood of a minority government, but not the effective number of parties in parliament as suggested by Mukherjee (and by Scartascini and Crain). Nowhere in his theoretical model does Mukherjee allude to why the abovementioned variables are absent from his analysis.²⁷

Third, Mukherjee claims that larger legislatures are more likely to be fragmented and that is why the size of the legislature is inversely related to the economic efficiency of government expenditure. This is an argument that is not intuitive and for which he provides no theoretical backing. Even in his statistical model, the magnitude of the effect of the legislature size on government expenditure is only a tiny fraction of the impact of the effective size of the parliamentary parties.

Fourth, the logic for the individual legislators failing to internalise the full cost of their local projects under the majoritarian system is that they are only burdened with a tiny fraction of the total tax costs given that national parliaments usually consist of tens, if not hundreds, of legislators, whereas the effective number of parliamentary parties is usually around five or six,

²⁶ This is a possibility limited by the dynamics of coalition politics.

²⁷ Mukherjee's empirical statistical model, which uses panel data on central government expenditure for 110 countries, includes an ordinal control variable for the number of parties in the ruling coalition. Interestingly, this variable is not in statistically significant relation to the size of government spending. Again, he makes no statement about the reason for this.

and rarely exceeds 10. This implies that the portion of the tax burden lying on each party's constituency is sizable and barely eliminable from the party calculus.

Fifth, if an increase in the number of parties in parliament implies more projects being approved by the ruling coalition, increased fragmentation simultaneously means smaller party constituencies and cheaper projects being required to appease those constituencies.

Yet, implicit in Mukherjee's work are two interesting inferences. On the one hand, he suggests that "in contrast with the dispersed nature of benefits from spending on public goods, the benefits from spending on subsidies and transfers can easily be targeted to "special interests" and core support constituencies inclusive of specific socioeconomic, demographic, and organized groups in society, which typically form the core support base of particular political parties. ... when the number of represented political parties in a multiparty legislature increases, therein implying greater representation of special interests and different constituencies, individual parties have stronger incentives to support spending on subsidies and transfers as it provides more "pork" to satisfy the demands of their constituencies." (Mukherjee 2003, 707)

Through his empirical modeling, Mukherjee shows (refer to table 8 in Mukherjee (2003)) that an increase in the total level of government spending with an increase in the party fragmentation is the result of growth in universal spending (taxes and transfers) being faster than the decline in targeted-spending (public goods). This observation clearly shows how previous research by Weingast, Weingast et al., and Inman and Fitts, which sought to explain the level of government expenditure solely by looking at its geographically-targeted component, was incomplete to say the least.

On the other hand, Mukherjee's empirical investigation also brings him to the conclusion that when controlled for the level of party diversification, neither government's left-right ideology, nor the electoral cycle, are statistically significant predictors of government expenditure. This inference is yet another clue for why, unlike what is claimed by some voter-centred theories, the reason for higher public expenditure under proportional systems is not the different ideological orientations of governments, but some other factors related to increase in the level of party competition when there is an increase in the number of parliamentary parties.²⁸

In the next section, the nuclei of the universalistic decision-making argument will be compared and contrasted with the geographic-targetability explanation of the size of the public sector under different electoral settings.

2.3.2 The geographic targetability approach

This school of politician-centred explanations of the fiscal effects of electoral systems concentrates on the distinction between the provision of *geographically-targetable goods* as opposed to *redistributive spending*; i.e. the type of spending that may be targeted to specific socio-economic groups with a diffused geographical distribution. District magnitude is often a

²⁸ Following on from Inman and Fitts' implicit discussion of the role of the size of the ruling coalition on government expenditure, Mukherjee also offers a theoretical model to explain the pattern of change in expenditure based on the ratio of MPs participating in government where there is a single-party majority. But since this latter constraint allows for no distinction between the electoral systems, we do not delve any deeper into it in this review.

key factor to distinguish between various types of electoral systems.²⁹ A general understanding in this school is that a varying significance of districting in electoral systems results in different patterns of incentives for parties and politicians regarding the type and extent of spending.

In its most developed form, this school argues that under majoritarian rules, electoral competition concentrates on certain electoral districts, and parties maximise their pledge for geographically-targetable spending (aka infrastructure spending, public goods) in these districts, reducing the amount of the same type of spending in non-marginal districts, and at the same time reducing the amount of redistributive spending due to its electoral insignificance (the Persson-Tabellini model).

On the contrary, in the proportional systems, because parties can garner vote among as many voters as they can satisfy, and the waste vote is at a minimum, each party focuses on satisfying a certain socio-economic group through redistributive spending. This implies a more diffused electoral competition over larger groups of voters potentially scattered all across a country. Therefore, there is a requirement for a higher level of overall spending compared to more limited and geographically-concentrated spending that takes place under majoritarian rules and single-member districting.

An advantage of this group of models is that they do not conceive the effects of electoral rules as operating through partisanship. In these models, parties of the Left and the Right alike will be more inclined to spend and redistribute under the proportional system; this implies that the impact of a government's ideology on spending policies may be contingent on other contextual variables (Lupu and Pontusson 2008; Jurado and Leon 2017).

The main contributions to this school were made between 1997 and 2002 through the works of Persson and Tabellini (1997, 1999, 2000), Lizzeri and Persico (2001), and Milesi-Ferretti, Perotti, Rostagno (2002). In this section, after presenting these three works, more recent developments in this school will be introduced by Gagliarducci, Nannicini and Naticchioni (2011), Funk and Gathmann (2013), and Jurado and Leon (2017).

The earliest proposed model based on the targeted-spending theory evolved out of the works of Persson and Tabellini between 1997 and 2000. While their model is plagued with fundamental problems and false predictions, it still clearly presents a picture of applying the idea of geographically-targeted spending vs. universal spending to explain the fiscal outcomes of electoral systems.

In their 1999 paper, Persson and Tabellini hypothesise a two-party competition under both proportional and majoritarian rules (this is the biggest flaw in their model). In so doing, they fail to endogenise the association between proportionality and higher fragmentation of the party system. Admittedly, they do so to reduce the burden of algebraic analysis, but by taking that path they ignore the very fundamental dynamics of coalition formation and coalition government under a fragmented party system.

In their model, society is divided into three groups of equal size corresponding to the lower, middle and higher classes in a class analysis framework. The two parties then have to simultaneously and independently offer electoral platforms to appeal to the voters in these groups in order to gain a majority of the seats in parliament. The model implicitly assumes an

²⁹ Majoritarian systems do not always coincide with single-member electoral districts. Many Majoritarian electoral systems such as MNTV and Block Vote are associated with large district magnitudes, but they are less commonly found at the national level. See chapter 3 for further information.

equal level of participation among voters in each class, which is yet another unrealistic proposition. Also, the following assumptions are explicit in their 1999 work:

1. A flat and non-distorting tax rate (t)
2. A balanced budget (i.e. no deficit-spending)
3. Probabilistic voting
4. Parties acting simultaneously and not cooperating in formulating their electoral platforms
5. A policy platform of the winning party is implemented
6. A multi-dimensional policy space
7. Given that parties are different in dimensions other than social policy (assumption 6), there are ideological differences between the parties and hence there is uncertainty of the outcome before the election because voters vote based on a combination of their assessment of the announced social policy platforms and their ideological attachment to the parties.
8. Different groups of voters have different variances in their ideological support for different parties, and the ideologically neutral group ($\approx$ middle class voters) has the highest number of swing voters (see figure 2.6).

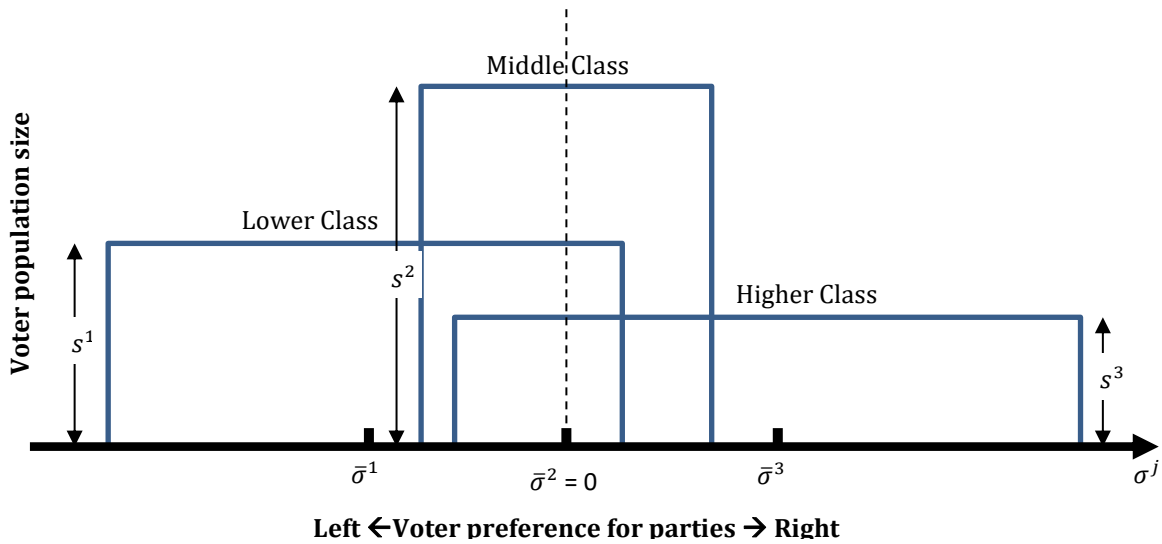


Figure 2.6
Distribution of voters' preferences (from Persson and Tabellini 1999)

Voter i has a utility function w_i (equation 2.6), which is equal to her disposable income $(1 - t)$ plus the redistributive benefits (b^i) and a concave utility function $H(g)$ measuring the perceived satisfaction from the supply of public or universal goods (g) such as transport, education, infrastructure, and law and order, which are by and large available to all citizens.

$$w_i = 1 - t + b^i + H(g) \quad (2.6)$$

t is the universal tax rate calculated based on the decided level of public and redistributive goods. $q = [t, g, \{b^i\}]$ is the policy vector proposed by the parties before the election. The balanced budget assumption is defined as:

$$3t = \sum_i b^i + g \quad (2.7)$$

If the parties are named A and B , voter j in group i votes for party A when:

$$w^i(q^A) > w^i(q^B) + (\delta + \sigma^j) \quad (2.8)$$

The second right-hand term is defined as voter j 's ideological preference for party B where δ is the universal but unknown component of it (inducing electoral uncertainty) and σ^j is the idiosyncratic element. The distribution of σ^j among voters in each class is known and is more concentrated around the group average in the middle class group while it has a lower and even lower concentration in the other two social classes respectively. This difference between the classes is illustrated in figure 2.6.

Persson and Tabellini's attitude towards solving the problem of social spending under different electoral systems is that under both systems the two parties eventually arrive at an identical policy platform to gain the minimum required seats with minimum fiscal commitments; this indicates an equilibrium. Irrespective of the electoral system, each party is ideologically closer either to the lower or the higher class, and the middle class consists of the majority of the swing voters, so in any case the major competition takes place over maximising the vote gain among the middle class voters.

Under a purely proportional electoral system, the whole country is defined as a single electoral district and both parties compete to gain 50% + 1 of the vote. This may be shown by equation 2.9 in which $\pi^{X,i}$ is the vote share of party X from group i ; P_{PR}^X is the probability of party X winning the election; and $E[.]$ is the expected value function:

$$P_{PR}^X = E \left[\frac{1}{3} \sum_i^{groups} \pi^{X,i} \geq \frac{1}{2} \right] \quad (2.9)$$

Figure 2.7 visually illustrates this point. If we assume that Party A is ideologically closer to the lower class, then it will offer a policy platform that can guarantee the support of a majority of a lower class voters (shown in green), half of the middle class voters (shown in yellow) and a small fraction of the higher class voters (shown in red). These shares will add up to 50% of the vote. Apparently, the calculations of party B which is closer to the higher class result in an identical policy platform, and therefore is skipped here. Persson and Tabellini argue that to achieve its goal, party A needs to provide a certain amount of public goods to buy the support of a majority of the lower class voters and a minority of the higher class voters. At the same time, the party needs to concentrate the redistributive spending on the middle class because this is where it has the highest manoeuvrability and faces the highest stakes. Hence, at equilibrium, both parties choose to tax all classes and distribute the proceeds to the middle class. By maximising equation 2.10, Persson and Tabellini arrive at the following policy vector for the proportional electoral system:³⁰

$$q_{PR}^A = q_{PR}^B = [t = 1, g_{PR}, b = \{0, b_{PR}^M, 0\}] \quad (2.10)$$

³⁰ Since Persson and Tabellini are not explicit regarding the mathematics of the maximisation problem, we only report their results in this review.

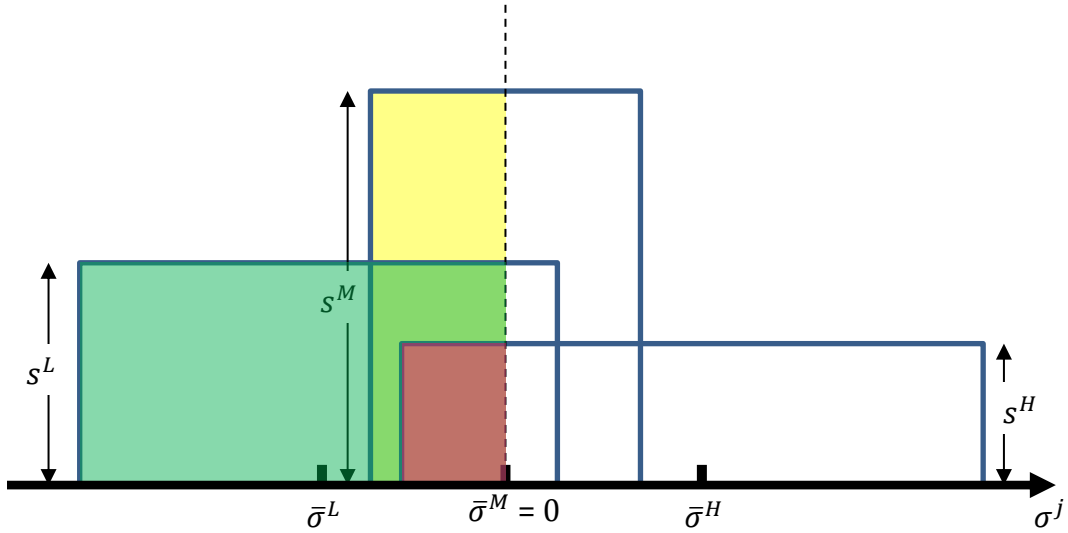


Figure 2.7

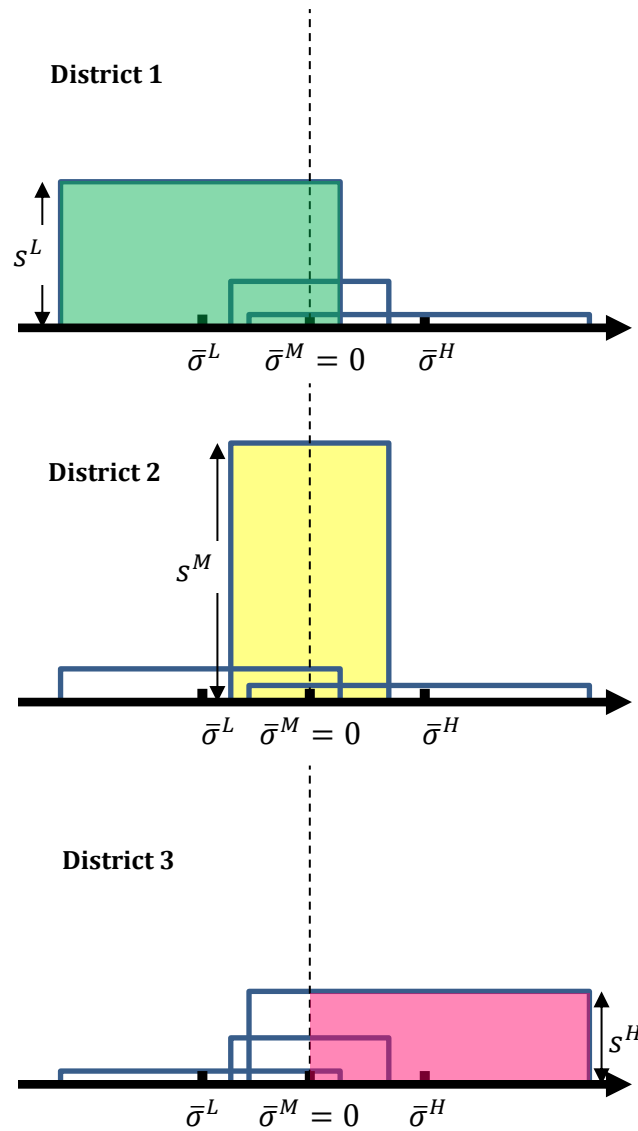
Class composition of voters under the proportional rules (based on Persson and Tabellini 1999)

To model the majoritarian system, Persson and Tabellini assume three electoral districts that perfectly correspond with the three economic classes. This is perhaps their second most problematic assumption after a fixed two-party system. Under majoritarian rules, each party needs to win a majority of the districts (i.e. two out of three) in their model. Each party focuses on winning the district of the class that is closest to it, as well as the district in which the middle class resides. But here lies the distinction between majoritarian and proportional systems: under the majoritarian system neither party would seek to invest electoral funds in their safe district because the outcome of the election in the safe districts is a certainty. In either of the two safe districts (districts 1 and 3), the base of support of one of the parties is completely dominant, and based on the electoral rule, only a simple majority is needed to win at the district level. As such, it is already clear that both parties will win in their safe districts and lose in the opponent's safe district. This implies that the entire electoral competition is concentrated in district 2, which houses the middle class. Figure 2.8 illustrates this dynamic. The probability of winning the election for either party (P_{MJ}^X) is the likelihood of that party winning a majority of the votes in the middle class district:

$$P_{MJ}^X = E \left[\pi^{X,M} \geq \frac{1}{2} \right] \quad (2.11)$$

$\pi^{X,M}$ in formula 2.11 is the vote share of party X in district M . The ensuing optimisation problem results in the following policy vector:

$$q_{MJ}^A = q_{MJ}^B = [t = 1, p \times g_{PR}, b = \{0, k \times b_{PR}^M, 0\}], \quad p < 1, \quad k > 1 \quad (2.12)$$

**Figure 2.8**

Class composition of voters in districts under the majoritarian rules (based on Persson and Tabellini 1999)

A comparison between equations 2.10 and 2.12 shows that the level of redistributive spending is higher under the majoritarian system; whereas the level of redistributive spending exceeds under the proportional system.

Understandably, due to the concentration of electoral competition in the marginal district, the level of redistributive expenditure on the middle class under the majoritarian system is higher than in its proportional counterpart. But the nature of this expenditure is ambivalent in Persson and Tebellini's theory. On the one hand, it is targeted at the middle class, and on the other it is locally targeted to the marginal district(s) and it is not clear which items are included in this baskets. At the same time, they conclude that the overall level of taxation is (a) at its maximum of 100% of the income; and (b) equal under both systems.³¹

³¹ This latter issue seems to have been corrected in their 2000 version of the paper (p. 218).

Further, Persson and Tabellini's approach to modelling the majoritarian system implies that swing districts under the majoritarian system should at least mostly comprise middle income voters. This is not proven to be the case by any other research that we are aware of.

Last, Persson and Tabellini's theory might be criticised on the grounds that its conclusion about redistribution from the lower (and higher) class to the middle class ignores the very important and empirically-valid condition of non-regressivity of redistribution; according to which, a redistribution that further exacerbates the initial social inequality is not politically viable.

In any case, this is the first theory that references to the idea of geographically-targeted spending as opposed to universal spending in explaining the fiscal outcomes of the electoral systems.

In a similar work, Debowicz, Saporiti and Wang (2016 and 2018) introduce the concept of *altruism* (the social importance of economic equality or fairness) to a setting very similar to that of Persson and Tabellini; and they both arrive at identical conclusions. They maintain that the equilibrium transfer level depends on the interplay of four factors: namely, the gap between the population and the group average pre-tax income, the relative ideological neutrality of the poor, parties' and voters' concern with income inequality, and the proportionality of the electoral system (Debowicz, Saporiti and Wang 2016). According to their theory, proportionality of the electoral system increases the level of redistribution to lower class voters. A second novelty of their model is to interpret the tax and transfer scheme to be the joint outcome of bargaining between the ruling party (coalition) and the opposition. This is especially relevant when it comes to minority governments.

Another model of targeted spending with similar conclusions is offered by Milesi-Ferretti, Perotti and Rostagno (2002). This model assumes a three member legislature and divides the society into three social groups of voters, and under majoritarian rules, additionally into three electoral districts. None of the groups comprises less than 25% or more than 50% of the population. Unlike Persson and Tabellini's model, in Milesi-Ferretti et al.'s model there is less restriction around geographical concentration of social groups.³² They only postulate that under the majoritarian system one of the groups is electorally dominant in two out of the three electoral districts.

For every voter i in group j in district k , they hypothesise a combined Cobb-Douglas utility curve of the form:

$$U_{ijk} = \left[(1-t)^{\beta_i} s_j^{1-\beta_i} \right]^{\alpha_i} g_k^{1-\alpha_i} \quad (2.13)$$

In which s_j is the redistributive good received by an individual in group j , g_k is the public good allocated to district k and t is the share of tax from the total income of a voter when the total income is normalised to 1. The tax rate is flat across districts and groups and productivity of all individuals is equal. The last point implies that the model has no provision for difference in the economic endowment level of the three groups, and hence, regressive distribution is not impossible. Parameters α_i and β_i are uniformly distributed across voters in each group. Milesi-Ferretti et al. do not hint as to the choice of the Cobb-Douglas function for their model.

³² This way under the proportional system, two and only two social groups are represented in the coalition government, each represented by 1 MP.

The policy vector upon which the government has to decide is $(t, \{s_j\}, \{g_k\})$, and given the assumption of universal productivity, the government budget constraint in their model is:

$$t = \sum_{j=1}^3 \mu_j s_j + \sum_{k=1}^3 g_k \quad (2.14)$$

where μ_j is the population size of group j .

Milesi-Ferretti et al. argue that in light of this information, politicians first optimise their desired policy vector $(t, \{s_j\}, \{g_k\})$ subject to government budget constraint keeping parameters α_i and β_i open for further optimisation. At this stage, they only seek to maximise the gain to their respective group. In the second stage, politicians optimise α_i and β_i to suit to the preference of the median voter within their own group because, according to the authors, it is the within-group median voter who is decisive in pre-selecting the group's representative.

Under the majoritarian system, the two representatives who form government are from the same social group (say, group 1), which, according to the model's assumption, is larger in two of the three districts. Let's assume that they represent districts 1 and 2. In this case, the optimisation problem they face is to maximise the transfer to their own group (s_1), and the public good for their own districts (g_1 and g_2). Under proportional rules, where there is single unitary electoral district and public good is not geographically targetable, coalition partners who represent two distinct social groups, mainly seek to maximise the redistributive good gained by their respective social groups (say, s_1 and s_2).

Table 2.3 presents the final policy vector with aggregate levels of redistributive and public goods under two different electoral systems after two stages of optimisation with respect to the levels of α and β preferred by the median voters denoted by α_m and β_m :³³

Table 2.3

The effect of the electoral system on the fiscal policy vector

Policy Item	Majoritarian system	Proportional system
t	$1 - \frac{\alpha_m \beta_m}{2 - \alpha_m}$	$\frac{1 + \alpha_m(1 - 2\beta_m)}{1 + \alpha_m(1 - \beta_m)}$
$s = \sum_{k=1}^3 s_k$	$\frac{\alpha_m(1 - \beta_m)}{2 - \alpha_m}$	$\frac{2\alpha_m(1 - \beta_m)}{1 + \alpha_m(1 - \beta_m)}$
$g = \sum_{k=1}^3 g_k$	$\frac{2(1 - \alpha_m)}{2 - \alpha_m}$	$\frac{1 - \alpha_m}{1 + \alpha_m(1 - \beta_m)}$

Source: Milesi-Ferretti, Perotti and Rostagno (2002)

Unfortunately, Milesi-Ferretti et al. do not offer sufficient technical details about how they optimise the utility functions of the groups. Also, based on the results in table 2.3, they conclude that redistributive spending is always higher under the proportional system, and spending on public goods is always higher under the majoritarian system for all values of α_m and β_m . To say the least, we do not find this conclusion obvious when comparing the parametric results of table

³³ Given the uniform distribution of α and β in all groups, the optimal level of the two parameters for the two groups represented in government under the proportional system is assumed to be identical.

2.3. Milesi-Ferretti et al. further argue that comparing the total level of social spending ($s + g = t$) between the two systems is not possible without knowing the exact values of α_m and β_m .

Several deficiencies may be attributable to this model. First, parties in this model are defined within the social segments so the model is unable to accommodate electoral competition and uncertainty because in the authors' view the composition of government is already evident in the model as a consequence of the electoral system and population size of the social groups.

Second, the number of parties is taken at three irrespective of the electoral system type, whereas increased proportionality often causes the party system to fragment into a two-party or tri-party system.

Third, although the model seeks interesting inferences from the distinction between local and segmental spending, eventually it fails to offer a clear argument about the overall level of social spending under different electoral settings.

Fourth, by severely restricting the size of the legislature and the number of parties in it, the model ignores the important dynamics involved in the government formation process and the risks associated with the collapse of the government coalition.

Fifth, as is evident in many similar models, Milesi-Ferretti et al.'s model does not guarantee the non-regressivity condition by assuming a homogenous distribution of economic endowment among the social groups.³⁴

Sixth, it is also unclear why it is assumed that under the majoritarian system there is always a social group that can win a majority of districts and form a unitary district. Once this assumption is relaxed, the policy vector would be identical under both systems and would render all predictions of the model invalid.

Last but not least, their optimisation results seem to be inattentive to the population parameters μ_i that are used in the budget constraint equation. This is evident due to the fact that none of the results presented in table 2.3 involve a μ_i parameter.

Lizzeri and Persico's model (2001) is somewhat different from the other two models, and only loosely can it be categorised under the geographic-targetability approach. In reality, their model predicts the likelihood of the provision of targetable vs. universal goods under different electoral incentives. In reality, unless one has the means to compare the size of expenditure on public goods with that of targetable goods, this model also does not allow for a comparison of the overall level of social spending under different electoral systems. However, as Lizzeri and Persico's approach has interesting and quite distinctive features, and because, due to very few restrictive assumptions, the core idea of the model can be applied to more complicated settings, we think it is important to include this model in this review. It must be noted from the onset that our graph visualisations present the core idea of Lizzeri and Persico's paper and not an exact replica of their mathematical definitions and notations.

In Lizzeri and Persico's model, each candidate in every election chooses between providing public goods to all residents in her electoral district, or to redistribute from some residents to

³⁴ For example, if the higher and middle classes are in coalition under the proportional system, they will seek to maximise the redistribution from the lower class to their own.

others (these extremes are called ‘pure strategies’). Taxation and redistribution is localised in districts, and the same dynamism is hypothesised in all districts. As in the previous model, this is the main limitation of this theory because it is not capable of distinguishing between highly-contested marginal seats (especially under the majoritarian system) and the different electoral dynamism that goes on in ‘safe’ seats. Also, the model runs on the assumption of a two-party competition, overlooking the higher level of party fragmentation in proportional systems.

Each voter has an endowment of one unit of money, so inequality and class politics is not considered. The utility of the public good to all voters is constant and is shown by G . If public good is to be provided, everyone loses their one unit of money and gains G . So, the overall utility under this scenario is $G - 1$ for all voters. When redistribution is opted for, some voters will be taxed up to their maximum income ($\max(\text{tax}) = -1$) and gain no utility, while others may be given a transfer of up to one unit of money³⁵ and left with an overall utility of 2 units of money. This implies variable taxation rates which unlike other models with flat tax may allow for non-regressivity. Other more general assumptions include:

- Candidates make binding promises to voters,
- Candidates choose to present their programs to the voters simultaneously and independently,
- Voters and candidates are fully rational and well-informed,
- Voters have no ideological bias to a specific party, which results in a uni-dimensional polity purely based on electoral gains, and
- A balanced budget

It is also important to note that given the Lizzeri and Persico model’s design, the category of targetable goods in fact refers to socially-targetable redistribution not geographically-targetable goods because the electoral competition is assumed to be entirely bound within single-member districts without having a national aspect to it.

According to the model, the key difference between the incentives arising under the proportional and majoritarian settings is that under the majoritarian system candidates have no incentives to gain more than half of the district votes because further votes do not translate into further seats. On the contrary, in the proportional system, few votes are wasted and the extra vote gain of a party in a district will eventually translate into more seats when adjustments are made at the national level. So, candidates have the incentive to maximise their party vote in the district to as many as they can. By assumption, both candidates seek to gain at least half of the votes even under the proportional rules.

When the utility of providing public good is higher than 2 ($G > 2$) then no redistribution can provide this level of utility to more than half of the voters; therefore, all candidates always choose to offer the public good (figure 2.9, right pane). Conversely, when $G < 1$ no candidate takes the electoral risk of offering the public good because there is always a redistribution scheme (including zero taxation and redistribution) that can offer a higher utility to at least half of the voters (figure 2.9, left pane). So, the aim of the model is to compare the provision of public goods under the two electoral systems when $1 < G < 2$ because in this range there is no

³⁵ As admitted by the authors, this is actually an arbitrary assumption. In reality, candidates can choose to redistribute in any way they wish. They can concentrate the transfers in a tiny portion of the population and give them more than one unit, but apparently this will compromise their share of the votes.

equilibrium of pure strategies (i.e. both candidates are offering redistribution or both are offering the public good).

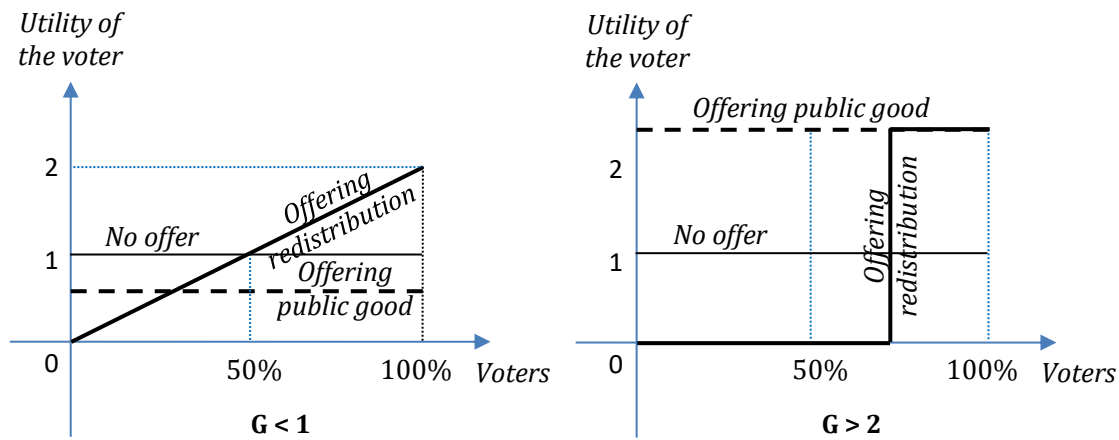


Figure 2.9

Utility resulted from offering public good and redistribution in Lizzeri and Persico's model when $G < 1$ and $G > 2$

In figure 2.10 we show the electoral incentives for offering public good under the majoritarian system when $1 < G < 2$. If candidate 1 chooses to offer the public good in the range $1 < G < 2$, regardless of the level of utility that the public good produces, the other candidate will always have enough resources to provide the same level of utility (or more) to half of the population through taxation of the other half and redistribution (in such a way that the red and green polygons have the same area). As a result, the choice of the public good happens at random i.e. half of the times.

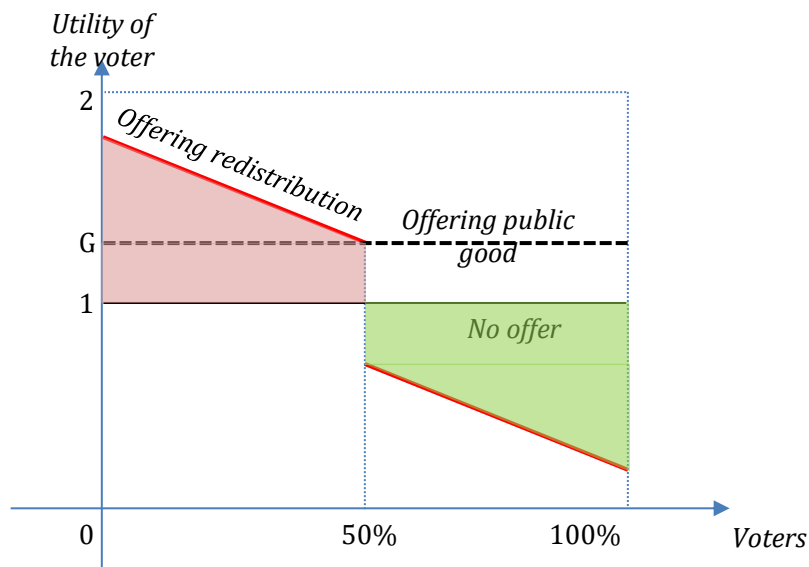


Figure 2.10

Incentives for redistribution under the majoritarian electoral system in Lizzeri and Persico's model when $1 < G < 2$

But under a proportional scheme (figure 2.11) the level of G has important implications. When candidate 1 offers public good and its level is closer to 1, as can be observed in the top pane of figure 2.11, candidate 2, who chooses redistribution, can easily beat candidate 1 and harness a high percentage of the votes (pertaining to point A) by taxing a tiny portion of the population (the green rectangle) and distributing to a large segment of the voters (the red rectangle). 'A' is always larger than 50% and close to 100%. Given this possibility, the likelihood of candidate 1 offering public good would be very small.

In contrast, when G is closer to 2, as in the bottom pane of figure 2.11, candidate 2 has limited manoeuvrability to retaliate through redistribution. She is still able to gain more than 50% of the vote (point B on the graph), but nowhere near what she could have gained in the former scenario. Knowing this limitation, now candidate 1 is more likely to offer public good.

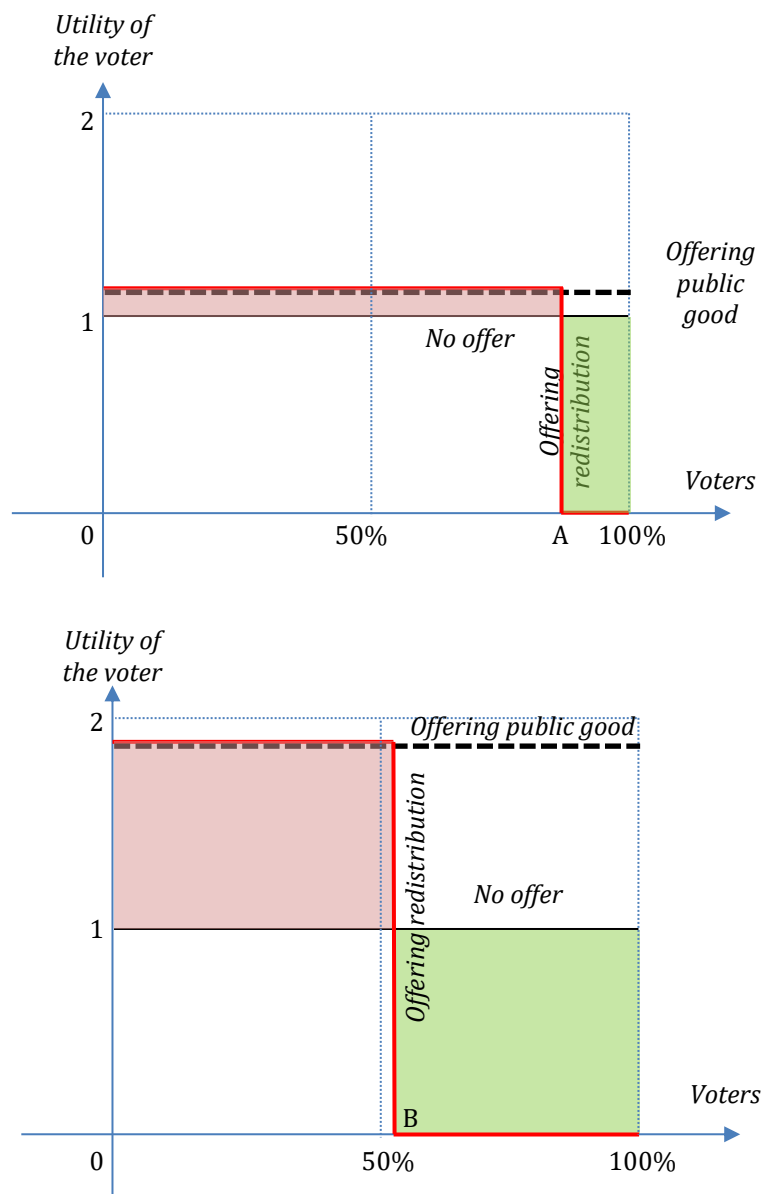


Figure 2.11

Incentives for redistribution under the proportional electoral system in Lizzeri and Persico's model when $1 < G < 2$

Analysing these two scenarios, one may conclude that under proportional rules, the likelihood of public good being offered is directly related to the level of utility produced by it. If G has a uniform distribution, then the likelihood of the provision of public good is equal with that of the majoritarian system. Otherwise, comparing between the two systems requires more information about the distribution of G . This last conclusion gives the Lizzeri and Persico model a distinct advantage over the former two models in this category: both of the previous models predict that public goods, such as infrastructure projects, are under-supplied under the proportional system. But Lizzeri and Persico anticipate that proportionality of the electoral system is not a barrier against the provision of public goods, and these goods will be provided by politicians when there is a demand for them in the electorates. This later hypothesis holds up to a greater extent against empirical scrutiny. Even Persson and Tabellini admit through their empirical investigation that support for the claim that geographically-targeted spending is less in countries with a proportional system is weak (Persson and Tabellini 1999).

As shown above, in terms of predictions regarding the overall level of social spending, all three models lack a predictive capability. Only Persson and Tabellini predict with their model a geographic concentration of electoral competition under the majoritarian system, and this might be a clue to explaining the empirical difference in the level of social spending under the two systems: because if electoral competition is limited to few marginal districts under the majoritarian system, this should imply that public goods are under-supplied in 'safe' districts. But we found no trace of this impact being reported in the literature. Other empirical studies, such as those carried out by Gagliarducci, Nannicini and Naticchioni (2011) and Funk and Gathmann (2013), confirm that the effect of targetability on the overall level of government social spending is at best ambiguous.

Two points help to understand the impotency of this group of models in explaining the difference in the level of social spending among electoral systems. First, this school fails to take into account that even proportional systems most often have a local/regional aspect too. Even multi-member electoral districts are geographically bounded, and MPs elected from such districts have a joint electoral interest in providing services to locals. At the same time, very often the MMDs under proportional systems house certain social groups in them and to a certain degree act as local strongholds of different parties. This implies that even under the proportional system there is incentive for geographical targeting of government expenditure; this confirms that local targetability is not such a useful analytical tool in explaining the phenomenon of interest.

Jusko (2015) offers a framework for criticising the theories that focus on geographic concentration of the electoral competition. By offering some examples, Jusko shows that demographic settings that these theories assume, such as equal social groups or their local concentration in certain electoral districts, are far from reality.³⁶ In reality, the geographic factor dictates varying patterns of concentration of economic classes in urban, sub-urban and rural districts across countries, and as pointed out above, heterogeneous compositions of district magnitudes even across similar electoral systems. These divergent patterns only remind us that

³⁶ For example, while Jusko agrees with the common assertion that by maximising the waste vote of the poor, the majoritarian systems can reduce their chance of electoral success and higher redistribution, she shows that depending on the distribution of the economic classes in electoral districts, the majoritarian system can result in higher taxation and redistribution compared to the proportional system.

electoral demographics as a fixed, heterogeneous and contextual factor is not fit for the purpose of explaining the different fiscal consequences of the different classes of electoral systems.

Second, there is a unanimous insensitivity to the level of party fragmentation and coalition formation and maintenance dynamics in this school of thought. As this research, among others, seeks to show, the level of party fragmentation is a strong predictor of the size of government expenditure and economic inequality in democracies; theories omitting this factor are at risk of missing a big part of the picture. In the next section we introduce a group of actor-centred models, which are more attentive to the effect of party fragmentation and coalition dynamics on social spending.

2.3.3 The Coalition effect approach

The third approach to explaining the different distributional effects of electoral systems with reference to the behaviour of politicians is the coalition effect theory. Unlike the universalist school, which lacks the partisan aspect, and the targetability school, which is concerned with the electoral calculus of the parties in districts, this line of theorisation concentrates on the question of post-election coalition-building between parties and how it may allow for coalition partners to demand a higher level of redistribution for their respective constituencies. Three major contributions may be distinguished in this school: Kontopoulos and Perotti (1999, 2002), Bawn and Rosenbluth (2003, 2006), and Persson, Roland and Tabellini (2003, 2007).

Like the universalist approach, and especially its “modified-universalism” version put forward by Mukherjee, here too, the argument is structured around the assumption of a common pool problem within the coalition government. But unlike the universalist theory, this strand does not base its argument on the hypothesis of an oversized coalition. Rather than the size of the coalition, what matters in this approach is (1) the inner dynamics of decision-making within the government coalition, and (2) the strategic considerations involved in the coalition formation in the context of a fragmented legislature. In all three works quoted above, the nexus between a higher redistribution under a coalition government and the electoral system is the empirical observation of more prevalent coalition governments (pertaining to a higher number of parliamentary parties) under the proportional system. The logic goes like this:

Coalition is more frequent under the proportional rules (Duverger Law) AND a coalition government results in higher social spending because it fails to internalise the full cost of social expenditure $\Rightarrow$ higher spending is more prevalent under the proportional rules.

The pioneering work in this school was the works of Perotti and Kontopoulos (1999, 2002). Although their research lacks a proper theoretical modelling of the phenomenon they seek to explain, they offered an elementary structure for the argument. Their core idea is that when in coalition, parties do not have to fully internalise the fiscal cost of higher spending. They can blame their coalition partners for the higher costs of taxation and the likely deficit, while they can claim the credit for the delivery of redistributive services to their potential vote base.

The fundamental insight behind this formulation is that “expenditure proposed by each agent in the majority can be closely targeted to the group the agent (i.e. party) represents while revenues with their distortionary costs can be extracted from a larger number of social groups” (Perotti and Kontopoulos 1999). On this basis, to participate in the government coalition, they

argue, each party has incentives to demand a share in the budget to be able to distinguish its performance in the coalition in order to be able to sell itself to its potential voter base. Consequently, the end result is a high level of expenditure or a large deficit irrespective of the ideological orientation of the parties and the socio-economic group they represent.

Following naturally from this line of reasoning, they maintain that the fraction of the costs associated with a desired level of spending by each party falls as the number of parties participating in government increases and the marginal cost of expenditure to each policymaker falls. “Thus, a larger number of participants in the budget setting process leads to a larger total expenditure” (Kontopoulos and Perotti 2002).

To construct their model, Kontopoulos and Perotti offer two measures of fragmentation in government: the first one is concerned with the number of decision-makers involved in the budget setting and is equal to the number of parties in the ruling coalition. Due to the number of parties in coalition being correlated with the number of parties in parliament, they call this a measure of *legislative fragmentation*. The second measure is the number of ministers in the cabinet, which targets the rules of the budget-making process. They call this the measure of *executive fragmentation*.

From this point onwards, Kontopoulos and Perotti’s research takes an empirical turn and shifts attention away from explaining the theoretical mechanics of effect of either of the above measures on fiscal policy. Using data from 20 OECD countries for the period 1960-1995, and 19 OECD countries between 1970 and 1995 in their 1999 and 2002 papers respectively, they conclude that executive fragmentation (particularly during the period that included the large macro-economic shocks of the seventies and early eighties) was an extremely important determinant of fiscal outcomes, whereas legislative fragmentation seemed to be much less salient and robust. Because the level of legislative fragmentation is not easy to curb, they prescribe reduction in the executive fragmentation as “a feasible and even popular institutional reform with a potentially significant impact on expenditure” (Perotti and Kontopoulos 1999).

One limitation of their semi-developed model, which they admit to, is the exclusion of the role of fragmentation over time, that is, the effects of government instability and of the frequency of government turnovers. Neither of the other two pieces of research that we will introduce in this section has incorporated this aspect in their study.

A more developed version of this theory was offered by Bawn and Rosenbluth (2003, 2006). In their model too, parties in coalition seek to maximise the project size they can offer to their vote base. They maintain that there is a difference in electoral accountability of the ruling party in a unitary government compared to partners in a coalition government, which results in systematic differences in their policy decisions. Their core insight (which they share with Iversen and Soskice) is that *ceteris paribus* coalition parties make policy choices differently to coalitions of parties, even when the same groups are represented.

A single party in government is accountable for all of its policy decisions since it must promote the collective interests of a broad support base if it wants to keep its majority. The dynamics are somewhat different for parties competing in a multi-party system. Under a multi-party system, parties compete not simply on the basis of their policy positions, but also on the priority they give to different issues. Consequently, when a party seeks the support of a particular group, it does so both by adopting something close to the group’s ideal policy and by emphasising the priority it will give to the group’s most salient issue. Participants in a coalition government are

held primarily responsible for a subset of policy decisions only in the policy areas in which they have the biggest stake. Hence, parties in coalition gain electoral support by externalising all costs and benefits that accrue to groups outside their narrow core of support. As a result, an increase in the number of parties in government (which may not necessarily increase the number of groups represented), increases the extent to which specific policy decisions balance diffused costs against targeted benefits. In turn, this culminates in less efficient bargains and a larger public sector rather than in a government composed of fewer parties.

As in Perotti and Kontopoulos's model, Bawn and Rosenbluth also argue that a higher number of parties in the legislature is associated with a larger public sector only insofar as it implies more parties are needed to form government. Their modelling approach allows them to show this theoretically, but their empirical findings offer little support for the claim.

A merit of this model is that it assumes a multi-dimensional polity where voters care about different issues with certain associated fiscal costs.

Bawn and Rosenbluth's first work (2003) lays the theoretical foundation of their modelling approach more elaborately, but presents a flawed mathematical model in which there is no degree of freedom for the parties to maximise their utility, and utility is only related to the total number of parties in parliament. This problem is addressed in their more recent work (2006). But even in this later model, they make their case through numerical examples rather than a parametric model. Here, we present the key assumption of their modelling approach mostly using their 2003 work, and present the model with generalised parametric equations drawn from the examples in their 2006 paper.

To build their model, Bawn and Rosenbluth assume a simple electorate divided into n groups of roughly equal size, each demanding a project called x_i of the same size. If x_i is the project demanded by social group i , then for all social groups benefits accruing from it are linear, that is $B(x_i) = x_i$ and costs are quadratic: $C(x_i) = x_i^2$. This proposal is inspired by the idea of decreasing marginal utility of the projects for the voters who want them.

Each party in government sets policy in a way that would internalise all the benefits of their own project and externalise all but a portion of the total costs of all projects by all groups proportionate to its size from the population. As a result, each coalition partner seeks to independently maximise its maximand equation defined as:

$$E(x_i) = B(x_i) - \frac{1}{n} \sum_{j=1}^n C(x_j) \quad (2.15)$$

Where the second term is the share of group i from the total cost of all projects and n is the total number of projects (because each group wants to internalise only $\frac{1}{n}$ of the total costs).³⁷

They further make the following assumptions in analysing the party cost/benefit calculus when forming government:

1. Real world complications of electoral systems (threshold, allocations formulas, districting etc.) are ignored as is the socio-economic heterogeneity of districts under the majoritarian rule,

³⁷ For more information on this approach to modelling government coalitions, see section 2.3.1

2. There is no discrepancy in the electoral participation rate of the voters among social groups,
3. The space of policy is multi-dimensional (the more parties, the more dimensions),
4. Governments are minimum winning coalitions (MWC) and different coalitions are equally likely. The formateur is chosen at random,
5. Parties in coalition get cabinet positions in proportion to their size,
6. Parties do not deviate from their electoral platform once elected,
7. Voters and groups assume that in multi-party governments, policy decisions are made by the coalition partner that gives the policy the highest priority,
8. Voters in social groups use assumption 6 to assess strategically the policy consequences of supporting the parties electorally and vote in a way that gives them the highest expected utility from the policy, given the behaviour of other groups,
9. Assumptions 6 and 7 are sufficient to make predictions about the policy decisions of short coalitions, and
10. A universal and flat tax rate.

In its abstract form, the model they formulate is as follows:

Assume that we have an even number of social groups ($N = 2m$) equally-sized and each represented by an independent political party:

Under majoritarian rule

Under majoritarian rule a two-party system is likely to emerge. Both parties seek to minimise their waste vote in competing for the median voters. As a result, each will seek representation from half of the voters/social groups. So it is reasonable to assume that the party forming the government represents half of the social groups (i.e. m groups). When determining the level of public spending, it is assumed that the ruling party aims at taxing the social groups represented by the opposition party (or parties) and distribute the proceeds equally among its constituent groups. Each group represented in government demands a project of the size x_i . The maximand equation for the party in this case may be defined as:

$$E(x_i) = B(x_i) - C(x_i) = mx_i - \frac{m}{2m} \sum_{j=1}^m (x_i)^2 = mx_i - \frac{1}{2} mx_i^2 \quad (2.16)$$

A relative maximum point on this equation is where the first derivative of the equation is equal to zero and the second derivative is negative. Since this is a second order equation with only one maximum or minimum, and the second derivative is always negative ($\frac{d^2E(x_i)}{dx_i^2} = -m$), all we need to do is to equate the first derivative to zero and solve the problem for x_i :

$$\text{if } \frac{dE(x_i)}{dx_i} = 0 \Rightarrow m - mx_i = 0 \Rightarrow \boxed{x_{i,MJ} = 1} \quad (2.17)$$

Given that half of the social groups (that are represented by the government) each have a project of the size x_i , the total cost of the public spending in this case would be:

$$C_{MJ} = \sum_{j=1}^m c(x_i)^2 = m x_i^2 \xrightarrow{x_i=1} \boxed{C_{MJ} = m} \quad (2.18)$$

Under the proportional rules a multiparty system is likely to emerge. Now it is assumed that each social group in the ruling coalition is represented by one party. The maximand equation in front of each coalition partner is then defined as:

$$E(x_i) = mx_i - \frac{1}{2m} \sum_{j=1}^m (x_i)^2 = mx_i - \frac{1}{2m} mx_i^2 \quad (2.19)$$

Maximising this equation yields:

$$\text{if } \frac{dE(x_i)}{dx_i} = 0 \Rightarrow m - x_i = 0 \Rightarrow \boxed{x_{i,PR} = m} \quad (2.20)$$

Which results in a spending level quadratic in size compared to the majoritarian scenario.

$$C_{PR} = \sum_{j=1}^m c(x_j)^2 = m m^2 \xrightarrow{x_i=m} \boxed{C_{PR} = m^3} \quad (2.21)$$

Middle scenarios

Middle scenarios involve a multi-party coalition government with a number of larger and smaller parties each representing a number of social groups. As this group involves numerous combinations, we present mathematical modelling for a simple case of a coalition of the size (m) involving two parties: one representing s social groups and the other representing $s - 1$ groups. Again, society consists of an even number of social groups ($N = 2m$).

$$m = s + (s - 1) = 2s - 1$$

Obviously, the coalition requirement implies $m \geq 3$. Bawn and Rosenbluth show in their modelling that the level of spending in such scenarios stands between the two extreme cases discussed above (two-party vs. multi-party). Maximising maximand equations independently for the two coalition partners will yield the sizes of their projects. It is important to note that here, the two coalition partners maximise their project sizes independently according to the following maximand equations:

$$E_1(x_i) = mx_i - \frac{s}{2m} \sum_{j=1}^m (x_i)^2 = mx_i - \frac{s}{2m} mx_i^2 \quad (2.22)$$

$$\text{if } \frac{dE_1(x_i)}{dx_i} = 0 \Rightarrow m - sx_i = 0 \Rightarrow \boxed{x_i = \frac{m}{s}} \quad (2.23)$$

$$E_2(x_j) = mx_j - \frac{m-s}{2m} \sum_{j=1}^m (x_j)^2 = mx_j - \frac{m-s}{2m} mx_j^2 \quad (2.24)$$

$$\text{if } \frac{dE_2(x_j)}{dx_j} = 0 \Rightarrow m - (m-s)x_j = 0 \Rightarrow \boxed{x_j = \frac{m}{m-s} = \frac{m}{s-1}} \quad (2.25)$$

And the total size of government social spending is:

$$C = \sum_{p=1}^m c(x_p)^2 = s \frac{m^2}{s^2} + (s-1) \frac{m^2}{(s-1)^2} = m^2 \left(2 \left[\frac{1}{m-1} + \frac{1}{m+1} \right] \right) = \boxed{m^2 \frac{4m}{m^2-1}} \quad (2.26)$$

For this level of consumption to stand between the two extreme cases, the following conditions need to be met:

$$\frac{1}{m} < \frac{4m}{m^2-1} < m \quad (2.27)$$

It can be easily shown that this condition always holds when $m \geq 3$. It can also be shown that the above conclusion holds when there is a minimum winning coalition, and the total number of parties is an odd number, or we have any other possible combinations of parties in the ruling coalition, so long as there are multiple coalition partners representing groups of different sizes.

Bawn and Rosenbluth's model is a neat and simple framework that touches upon one of the most likely linking mechanisms between electoral systems and their distributional impacts. However, their model still suffers from certain structural shortfalls:

First and foremost, in modelling the calculations of the coalition partners, they assume that each party seeks to maximise the total coalition benefit against its own share of the total cost. They do not explain why a party would consider the total benefit as opposed to its own benefit as is the common assumption in the "universalist" literature, for example. This interpretation (that each party seeks to maximise the benefit of the entire coalition) implies that the model does not explain the coalition formation process and the uncertainty surrounding it. It simply starts from when a coalition is formed, and because, in their view, all MWCs are equally likely, coalition members seek to maximise the gain of their coalition partners to keep them in coalition. As such, their theory avoids the problem of uncertainty and takes the composition of the government as something random.

If we substitute their assumption with the weaker assumption that each party seeks to maximise its own benefit against its share of the total costs, then the optimum choice of spending under the proportional system would be identical to the optimum spending level under the two-party system.

Second, the model also postulates that each coalition partner seeks to externalise the cost of total spending to other social groups including those that are represented in government by other parties. This is the exact-same approach that was adopted in the universalist school because a universalist coalition was hypothesised as being opposed to a MWC. Bawn and Rosenbluth do not justify why they incorporate this design in their model because in a MWC, imposing costs on other coalition partners is politically costly and may result in the collapse of the government coalition. Even if this assumption is excluded and all the costs of government expenditure are imposed on the opposition, the result would still be very problematic; because unlike the class alliances framework in which the model distinguishes between different income classes, here all classes are assumed to be identical, and transfer from groups associated with the opposition parties to groups represented in government would violate the critical non-regressivity assumption.

Third, and related to the first problem, in the middle scenario their model results in larger project sizes for groups that are represented by the smaller coalition partner than those represented by a larger coalition partner. They offer no game-theoretic explanation as to why the party representing more social groups would be willing to enter into such a coalition when they can pick a minor coalition partner that would be happy to accept smaller project sizes and still gain from redistribution by joining the government.

Fourth, in this model, parties independently maximise their maximand equation. This is especially problematic under the middle scenario where each coalition partner assumes that the other coalition partners wants a project size equal to its own. The source of this assumption is obscure in Bawn and Rosenbluth, and is in violation of the model's outcome, which is projects of different sizes for constituting groups of various coalition parties.

Fifth, difference in the level of spending between the two extreme scenarios is in a numerical quadratic relationship, meaning that spending under the extreme proportional scenario is $\left(\frac{N}{2}\right)^2$ times the level of spending under the two-party scenario. For example, when there are six social groups, under the extreme proportional scenario, spending is nine times higher than under the two-party scenario. It is well-known that this is very much removed from reality, and the difference in the level of social spending among countries with similar levels of economic development and with opposing electoral systems may rarely exceed two to three times. The implication is that this approach to modelling barely captures the essence of empirical reality.

Last but not least, Bawn and Rosenbluth's model is sensitive to the relative size of the social groups being represented by parties. The key assumption of the model is that social groups are of an equal size, but the researchers offer no adjustment for the realistic scenario in which groups may drastically differ in size.

The third contribution to the coalition effect theory is made by Persson, Roland and, Tabellini. As in other theories in this group, they too view the effect of electoral systems on fiscal policy outcomes to be indirect and through the medium of party fragmentation in parliament. But while Perotti and Kontopoulos, and Bawn and Rosenbluth, highlight the problem of internalising the cost of the expenditure in fragmented coalitions as the root cause of higher spending under a coalition government, the major emphasis of Persson, Roland and Tabellini is on the electoral conflict between coalition partners. So while in the former approach parties simply want to maximise the benefits to their respective social group, in the latter they have to do so to save themselves from the systemic predicament imposed by the electoral system. Persson, Roland and Tabellini's argument is in fact one level more elaborate than Bawn and Rosenbluth's, which explains why they claim their framework to be more formal compared to Bawn and Rosenbluth's. Also, their model does not produce numerical values for comparison, which is at least better than Bawn and Rosenbluth's superficial ratios between the levels of spending under different electoral systems.³⁸

Persson, Roland and Tabellini's emphasis on the significance of the level of coalition fragmentation as an explanatory factor for the fiscal policy stems from their key idea that voters can distinguish between the parties of a coalition government at the polls, while they cannot distinguish between different factions of a single-party government.

Another novelty of Persson, Roland and Tabellini's research is that they analyse the fiscal impact of both unitary and coalition governments under both proportional and majoritarian electoral rules. They try to show that regardless of the electoral system in place, coalition governments always tend to spend more.

³⁸ Also in their empirical analysis, Persson, Roland and Tabellini arrive at a reasonable figure for the difference in the spending level between majoritarian and proportional countries. They report a 5% (of GDP) higher social expenditure under the proportional rules.

In their model, a population consists of four economic groups of equal size and four parties each largely representing one of the groups. Preference of individuals in group j is defined by:

$$V^j(\mathbf{g}) = 1 - \tau + H(g^j) \quad (2.28)$$

Where $\mathbf{g}$ is the vector of projects designated to all groups by the government, g^j is the project offered to group j by party j which is in power. τ is the level of taxation levied on all individuals and $1 - \tau$ is the individual's disposable income. $H(\cdot)$ is a well-behaved concave utility curve as per figure 2.12.

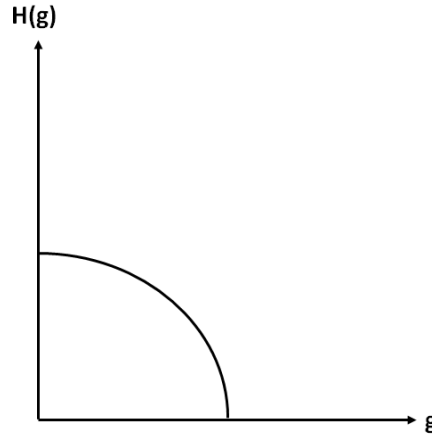


Figure 2.12
A well-behaved concave utility curve

It must be noted that Persson, Roland and Tabellini call group projects (vector $\mathbf{g}$) 'local public goods' in the context of social groups, so the definition that they use does not correspond with geographically-targeted spending; instead, it is targeted towards certain social groups.

There is no deficit spending, which implies that total revenue equals total spending:

$$4\tau = \sum_{j=1}^4 g^j \quad (2.29)$$

Citizen i in group J votes for party J , when the latter is in government, if:

$$V^J(\mathbf{g}) \geq V^J(\mathbf{g}_G^*) + \omega^i + \delta \quad (2.30)$$

$\mathbf{g}_G^*$ denotes the equilibrium policy vector for a given type of government. Single-party government is shown by $\mathbf{g}_S^*$ and coalition government by $\mathbf{g}_C^*$. $V^J(\mathbf{g}_G^*)$ reflects voters' expectations of what governments can reasonably be expected to deliver, given the political circumstances in which policy is set. $V^J(\mathbf{g}_G^*)$ is taken as a given by the incumbent when it sets policy and reflects the implicit assumption that voters are more demanding if they realise that in equilibrium the government can deliver a high level of welfare.

ω^i is the individual component of reservation utility which is uniformly distributed within each group of voters. Individuals with higher values of ω^i are more demanding of the incumbent government. ω^i has a mean zero and density φ . A higher value of φ , corresponding to less within-group dispersion, means that policy favours buy more swing voters in each group.

δ is the random shock to the popularity of the incumbent government, common to all voters. δ is also uniformly distributed, with mean 0 and density ψ . a higher value of ψ means less uncertainty about the distribution of the popularity shock.

When the incumbent government sets policy, it knows the distributions of ω^i and δ , but not the realisation of the aggregate popularity shock δ .

Persson, Roland and Tabellini leave many aspects of their parametric model either unexplained or minimally elucidated, including the way they define a function $F(\omega)$ for the fraction of voters in a certain social group who vote for a specific party³⁹ and the mathematical solution for their maximisation problem of the vote share of the parties. As such, we limit ourselves to only discussing their results and investigating their argument.

Electoral politics is a two-stage game in which first parties in government set policy and then voters observe the policy and vote retrospectively. An equilibrium of this two-stage game is:

- (a) A policy optimally selected at stage (i) by the parties in each possible government, taking into account the expected equilibrium outcome at stage (ii).
- (b) An election outcome, given the equilibrium economic policy and the type of government.

The following assumptions are made explicitly or otherwise:

1. Politicians and parties are opportunistic, only seeking to win elections, and the policy preferences of parties are endogenous.
2. There is uncertainty regarding the electoral outcome.
3. Coalitions are minimum winning, and unitary governments are not minority governments.
4. Coalition partners have a unilateral decision-making power over the dimension that benefits them most.
5. All parties in the coalition unanimously agree on the level of universalistic spending that benefits all social groups.
6. The tax rate τ is flat and residually determined so as to balance the budget, once all spending decisions have been made.
7. There is at least some inefficiency in bargaining, such that one party does not fully internalise the effects of its discretionary decisions on the coalition partner.
8. Voters are not fully rational, strategic, and forward-looking players. On the contrary, professional politicians are strategic and fully rational.
9. Ideology or party attachment plays a role in voting decisions of the voter (as voters treat their own party differently than the parties representing other groups). However, retrospective, sincere and probabilistic voting is more important than strategic voting.
10. Each party represents one of the social groups by and large, but have supporters among other groups as well.
11. If a citizen's party is in government (/opposition) and she is satisfied with it, then she will vote for it. Otherwise, it is equally likely that she may vote for any other party which is in opposition (/government).

This list demonstrates that, unlike Kontopoulos and Perotti, and Bawn and Rosenbluth, Persson et al. do not care about the platform commitment of the parties. This difference stems from the fact that for Persson et al., fiscal policy decisions are not the result of electoral competition but

³⁹ They define $F(\omega) = \frac{1}{2} + \varphi\omega$

uniquely originate from the incentive of the incumbent to ensure its re-election. As such, the use of the term equilibrium in their work is somewhat confusing and unconventional. In other theories, parties usually promise certain policy vectors (and later implement them when in power) based on their knowledge of their competitors' electoral incentives and voters' preferences. But in Persson et al., the incumbent sets policy only in anticipation of the impact of the electoral system on how they are able to utilise support from different social groups. This approach yields a peculiar and narrow inclusion of the 'level of competition' as an explanatory factor in the model.

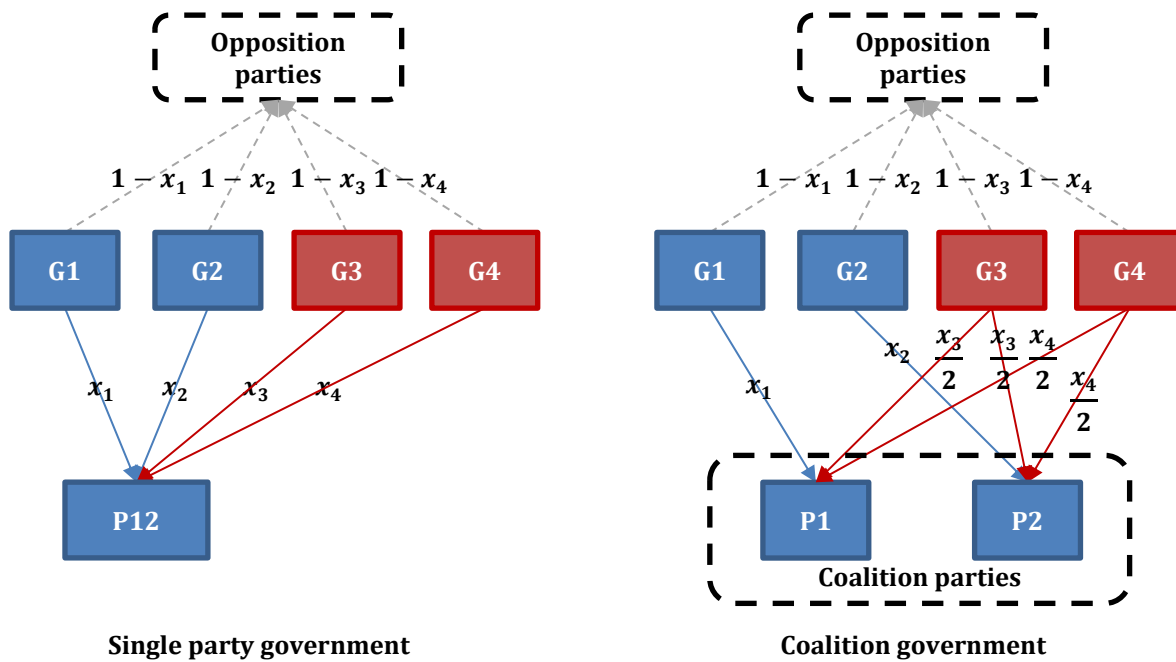


Figure 2.13

The Voting decision of the social groups in the Persson, Roland and Tabellini (2007) model

The key mechanism that Persson et al. hypothesise to mediate between the electoral system and spending outcomes is the internal rivalry within the coalition. The dynamics of this relationship is shown in figure 2.13. As per the right pane, according to the tenth assumption, groups G1 and G2 are independently represented in government by parties P1 and P2. The percentage of voters in these groups who want to vote for their respective parties is shown by x_1 and x_2 .⁴⁰ Looking at the performance of the government, these voters are able to distinguish between the two coalition partners, and if they are satisfied, they will only vote for their own party in the upcoming election. The situation is completely different with those in groups G3 and G4 who are satisfied with the conduct of the government. The majority of voters in groups G3 and G4 are represented by the opposition. The minority of voters in these groups, who are happy with the incumbent government and want to vote for it, are not able to distinguish between the constituent parties of the ruling coalition. As such, they are equally likely to vote for either of the coalition partners. If the share of these voters in each opposition group is shown by x_3 and x_4 ,

⁴⁰ Those who change their mind and vote for the opposition in each group are shown by $1 - x_1$ and $1 - x_2$ respectively, but this is not important for the conclusion to the theory.

and there are two parties in the ruling coalition, each of the parties will get $\frac{(x_3+x_4)}{2}$ of the vote from groups 3 and 4.

In contrast to the coalition government, when only one party is in power (mainly representing half of the social groups), there is no within-government rivalry and the ruling party will attract the vote of all voters in every social group who are satisfied with its performance (left pane in figure 2.13).

Persson et al. claim that the hypothesised conflict in the coalition government leads to the ruling parties placing higher importance on their own social groups to extract more vote compared to groups that are mainly represented by the opposition. Since coalition members choose local public goods unilaterally (assumption 4), these electoral concerns give rise to an electoral common-pool problem by which the necessary financing comes out of taxes levied on all groups, and both parties in government spend more on their constituencies because these constituencies are more likely to vote for them.

The optimum level of spending for social groups when a single-party government is in office is:

$$g_s^* = H_g^{-1}(1), \text{ for all } J \quad (2.31)$$

meaning that all groups receive a project corresponding with the value 1 on the utility function $H(\cdot)$. But under coalition the project sizes for the groups represented in the government and those in opposition are:

$$g_c^* = \begin{cases} H_g^{-1}\left(\frac{1}{2}\right), & \text{if } J = 1,2 \\ H_g^{-1}(1), & \text{if } J = 3,4 \end{cases} \quad (2.32)$$

indicating that the level of spending for groups 1 and 2 is higher than groups 3 and 4 given the form of the utility function $H(\cdot)$.

By this formulation, the level of spending is a function of: (a) the likelihood of coalition government under a certain electoral system, and (b) the level of party fragmentation within the ruling coalition.

Some issues in the structure of this theory are debatable. First, a problem with the notion that 'ruling parties overspend on their own electorate because those electorates are more likely to vote for them' is that it is not exclusive to coalition governments. Persson et al. assert that a unitary government spends equally on different social groups, whereas they simultaneously admit that certain social groups are more likely than the others to vote for the ruling party.

Second, their formula for the expected vote share of the ruling party in the single-party scenario is even more ambiguous. The paper gives the formula as:

$$\text{Vote share of the ruling party} = \frac{1}{4} \sum_{j=1}^4 F(\omega^j) = \frac{1}{2} + \frac{1}{4} \sum_{j=1}^4 (V^j - V^{*j}) \quad (2.33)$$

In this formula, $F(\omega^j)$ denote the cumulative distribution function of ω^j . According to this formula the vote share of the ruling party is always more than 50% irrespective of its level of spending on different social groups. If so, then it is not clear why the ruling party would want to spend at all (especially for the core constituencies of the opposition parties) if it is always the winner of the election.

Related to the above point, the theory states that at equilibrium, both incumbent parties spent more on their own groups to garner higher electoral support from them, but spend the same on

opposition groups compared to the unitary government scenario. However, when both coalition partners spend equally more on their respective social groups then at equilibrium they only end up receiving the same share of extra votes from their groups; consequently, they will have the same share of cabinet offices and government power. So, all that this overspending can bring about is to divert some of the votes from groups 1 and 2 to the opposition parties, resulting in the inflation of the combined seat share of the coalition above a simple majority without changing the seat ratio of the coalition partners. Evidently, the whole scheme offers no added utility to either party other than it imposes a higher tax burden on the whole society, which in turn can be electorally costly to the incumbent. This point can invalidate the very mechanism at the heart of this theory and refute its argument.

Third, the idea that under a multi-party government coalition, partners spend more on their own constituency does not prove *per se* that the total level of coalition spending is higher under a coalition government because rather than increasing the overall spending, the coalition partners can divert social spending from opposition social groups to their own, and in so doing, alter the pattern of distribution of spending. It seems that Persson et al.'s research has omitted this aspect of the question.

Fourth, and perhaps most important of all, Persson et al. assume that coalition partners are distinguishable by their supporters in their own associated social groups, but not by the supporters of the government in social groups that are predominantly represented by opposition parties. This counter-intuitive assertion amounts to an asymmetry of information between the social groups; and explanation for this inconsistency is totally absent from their study. Even if this assertion is true, there can be no assurances that the vote coming from the opposition constituencies would split equally between the coalition partners. In this scenario, if the assumption of equal split does not hold, then the parties in government would see a very different picture and behave differently.

Fifth, when Persson et al. discuss the unitary and coalition governments under the majoritarian system, two of their assumptions are specifically unrealistic. First, they assume that the distribution of economic groups is identical in all electoral districts. This is not evident in most cases in countries with majoritarian electoral systems. Just like theories in the geographic-targetability class, given the centrality of local districting in majoritarian systems such assumptions result in a superficial analysis.⁴¹ Second, rather than analysing the voting dynamics within the single-member districts, they wrongly deal with the whole legislature *en bloc*. They go as far as to argue that the party that can win a plurality of the overall vote would win the entire legislature as if there is no districting at all, whereas in reality we know that for a party to form a unitary government under majoritarian rules, it only needs a quarter of the vote (half of the vote in half of the districts) which begs a very different analytical approach than that offered by Persson et al.

Finally, perhaps the most notable contribution of this theory is its attention to the level of electoral competition as a direct outcome of change in electoral rules. While this theory is novel

⁴¹ In the appendix to their 2003 paper, Persson, Roland and Tabellini discuss the implications of district heterogeneity for their synthesis, but only for the coalition government scenario. They conclude that "[under heterogeneity] in a coalition government, the equilibrium policy does change with the number of parties in the opposition. This is thus different from what we have under homogeneity where equilibrium policy depends only on the government structure and not on the number of parties" (2003, 48-49).

in offering a framework capable of accommodating the level of electoral competition at the interval level (and it might be highlighted as a big step forward compared to other theories in the literature), the incomplete attention to the question of competition is simultaneously another deficiency of the Persson et al. theory. The theory neglects the level of competition that is induced by the increase in the overall fragmentation of the party system and is only concerned with executive fragmentation (cf. Aminnaseri and Mooi-Reci (2014)). As such, the idea of electoral competition as an intermediary factor to explain the fiscal impacts of electoral systems is only adopted in a limited sense.

On the positive side, arguments in this school do not rely on the distinction between universal and targeted spending, and hence are free from issues affecting the geographic-targetability school. They are also constructed on more realistic assumptions and are independent of problematic assumptions such as a fixed number of parties in the model, division of voters into economic classes of equal size, over-sized coalition or uni-dimensional policy space.

Similar to other theories in the literature, this school does not break with the flat tax rate assumption, which is barely the case in practice. In addition, the theory does not endogenise the fact that under proportionality, where the waste vote is minimal, parties have to compete over non-voters who are predominantly concentrated at the lower end of the economic distribution. This aside, neither of the theories in this school offers a guarantee against the critical problem of non-regressivity. The common claim that coalition governments spend more on the constituencies they represent implies that when a right-of-centre government is in power it would transfer wealth to the wealthier social groups and worsen the post-redistribution inequality. This is not supported by empirical evidence.

2.3.3.1 The “veto points” argument

A minor offshoot of the coalition effect theory is the veto-points argument proposed by Crepaz and Moser (2004). Since they do not offer a fully elaborated model and only sketch the main tenets of their idea, we only devote a limited space in this chapter to introduce this research.

Similar to the coalition effect theory, the main analytical framework of Crepaz and Moser’s theory is the study of motivations and interactions of the parties when in coalition. They build their theory around the idea of veto points and introduce two concepts: *Collective vs. competitive veto points*.

Collective veto points are political institutions that are diffused in such a way that the actors interact with each other personally and governing requires their collective agency and shared responsibility. Coalition government is an example.

Competitive veto points are institutions that represent separate agencies with mutual veto powers that compete against each other and restrain the operation of government (institutional diffusion of power). Exemplars of such diffusion are presidentialism, federalism and bicameralism.

According to Crepaz and Moser, when power is institutionally diffused as in the case of competitive veto points, and institutions represent competing agencies with mutual veto powers, then when bills get stuck in such a formation, the public perception is not of a recalcitrant party, but an institution itself that provides an obstacle. In other words, blame is not “personalised” but is rather “institutionalised” and parties or some prominent actors within

the parties can “hide” behind “faceless” institutions. As a result, vetoing bills is less costly and thus, are used more often, making it more difficult to change the status quo. Such institutions have a tendency to restrain government, sometimes to the extent of leading to deadlock, immobilism, and even a shutdown of the government.

Alternatively, under a coalition government (a case of cooperative veto points), due to higher visibility of the political actors, blame blaming of the government in the eyes of the public is “personalised” to the parties that are partners to these decisions. Here, shared responsibility for political success or failure, and the subsequent moral obligation combined with face-to-face interaction of coalition members and the resulting logrolling, results in a common interest in maintaining the coalition. This interest is oftentimes accompanied with a weakened intention to exercise restraint to control each other’s budgets and makes coalition governments more likely to spend more rather than less.

It may be argued that comparing the composition of government (coalition/unitary) with institutions such as presidentialism, federalism and bicameralism is a pear and apple comparison in the context of debating over the effect of electoral systems. This is not true. Institutions such as federalism, bicameralism and separation of power in the form of presidentialism, which are emblematic of a system with more competitive veto points, are at the same time symptomatic of dual power and decreased proportionality when decisions are to be collectively ratified by those institutions. This is because at times the composition of social forces in these institutions (represented by parties) are at odds, undermining the notion of proportional access to national decision-making for political parties. As such, Crepaz and Moser’s theory seems to be a competent tool for comparison between the two broad types of electoral systems.

Crepaz and Moser identify morality of duty and logrolling as two consecutive causal phenomena, translating the effect of collective veto point institutions to fiscal preferences among coalition partners.

Morality of duty is a strong normative argument that binds members of a coalition together even though it is not electorally binding. “The sometimes lengthy negotiations over ministers, portfolios, committee chairs, and membership structures generally culminate in the signing of a coalition agreement, the purpose of which is to ensure that promises are being kept and that nothing is done to harm the immediate interests of the constituency of a coalition party. It also codifies a certain form of behavior by establishing an *esprit de corps* that has a material force beyond the logic of logrolling while at the same time raising the stakes in case a party intends to quit the coalition. ... Political costs associated with being a party that might be responsible for the fall of a government or singled out as the reason for having created political instability pushes the parties to observe the established group spirit.” (Crepaz and Moser 2004, 265)

Logrolling is a classic case of a collective action problem whereby morality of duty, combined with face-to-face interactions between political actors, parochial interests of coalition partners and their tremendous power to potentially topple the government, rationally encourages them to engage in more spending even though it might be in the interest of the coalition as a whole to reduce government growth. The problem here is that from the perspective of an individual party, it is not rational to engage in less spending while the other coalition members increase spending. Crepaz and Moser argue that logrolling occurs not only during coalition government but also during the process of coalition formation.

They also make an important point by arguing for the measurement of the degree of parliament fragmentation as opposed to coalition fragmentation as the explanatory variable. In their view, the degree of ruling coalition fragmentation is an invalid measure, as it does not capture how much compromise and logrolling is, in fact, going on between the party in power and opposition parties when a minority government is in power, given that minority government is not an uncommon phenomenon in democracies.⁴²

2.3.4 The consumer-producer framework

The last group of party centred theories of the fiscal effects of electoral systems is developed through the works of Rogowski and Kayser (2002) and Chang, Kayser, Linzer and Rogowski (2011). This group draws its main inferences from the field of economics and applies them to the electoral competition framework. Rather than dividing the voters into economic classes, their theories split them between producer and consumer groups.

The producer group has an endowment of money that it can donate to electoral campaigns and they also have votes to cast. On the opposite side, the consumer group can afford to vote for the parties. These two groups are assumed to be mutually exclusive (but only for simplicity) and to have a conflict of interest. They model this conflict through the Stigler-Peltzman regulation framework as shown in figure 2.14. The horizontal axis on this graph shows the price, and the vertical axis shows profit. Consumers see that it is in their best interest to face competitive prices (P_c) and producers prefer the monopoly price (P_m), which can maximise their profit (at the expense of a deadweight loss to society's overall welfare).

Through regulatory means such as taxes, tariffs and quotas, governments can impose a medium average price level (P_r) that represents a compromise between the interests of producers and consumers. At this point, the marginal rate of substitution between electoral support of consumers and producers is equal and an iso-support curve is tangent to the price-profit hump. Due to the fact that the main regulatory tool for governments to control prices is taxation, the consumer class prefers lower taxation pertaining to lower prices and the producer class prefers higher taxation and hence more redistribution.

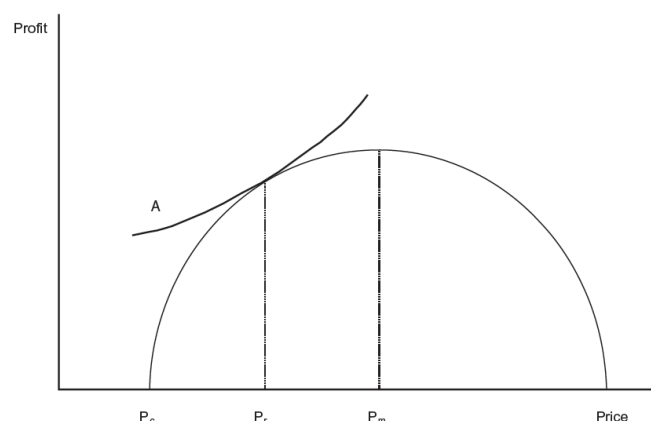


Figure 2.14

Stigler-Peltzman regulation framework (source: Chang et al. 2011)

⁴² A perhaps more accurate alternative to this approach would be to control the incidence of minority governments in empirical modelling.

In both Rogowski and Kayser (2002) and Chang et al. (2011) this compromise is presented in the form of a Cobb-Douglas electoral support function shown by formula 2.34.

$$S = M^\alpha L^{1-\alpha} | \alpha \in (0,1) \quad (2.34)$$

In this formula, S represents electoral support for a party, M is the supply of campaign funds and L is legislative support in the form of votes.

Rogowski and Kayser introduce the concept of *responsiveness* for the electoral systems. They maintain that under the proportional system, seat share between the parties changes in tandem with their vote share. Under the majoritarian system, however, a one percent increase in the vote share of a large party increases its seat share by a larger proportion, implying higher elasticity of the vote-seat relationship. As such, proportional electoral systems are less responsive to the preferences of the voters. So the social group that has a higher endowment of votes (consumers) can impose its agenda (lower taxes/lower prices) on the running parties more successfully in electoral equilibrium under the majoritarian system. A lack of this possibility under the proportional rules means that the producer group, including organised labour, gains the upper hand, forcing politicians to raise taxes and subsequently increase social spending. It is evident that higher social spending in the consumer-producer logic is a corollary and not a direct outcome intended by the voters.

The idea of dividing society into two exclusive classes of producers and consumers in Rogowski and Kayser's model is confusing, and certainly unrealistic, especially when it comes to the producer class. According to Rogowski and Kayser, because the interest of producers is in maximising their profit from production, but at the same time setting higher prices, the most likely result of which is higher taxation in a micro-economic sense.

Chang et al.'s work (2011) offers some clues to an alternative to cope with the above dilemma. As a work-around, rather than thinking of two social groups, we may think of two conflicting social forces: one of consumption and one of production. The productive force is almost evenly distributed in society across the board so far as the employed population is concerned. But the consumption force is mostly concentrated in the middle class and the numerically insignificant, but economically powerful, bourgeoisie. The working class only has a limited purchase power compared to the other two classes. So when the middle class expands and comprises a larger portion of the voting population, the majoritarian system can better twist the social policy in their favour, which is tantamount to lower taxation and less social spending. This work-around helps make sense of the consumer-producer framework. Otherwise, if the producer class is taken as proxy for bourgeoisie, which is endowed with little votes but a larger electoral donation capacity, then it would not be clear why in this model the producer group would opt for higher prices and hence higher taxation (unless the relationship between the price level and taxation is relaxed). If this is the case, then this framework may not be capable of explaining the difference in public social expenditure under different electoral systems.

2.4 Summary

In this chapter, we reviewed various approaches in the literature to the question of the fiscal impacts of electoral systems, and introduced theories that use those approaches. Each theory and (where available) its parametric model was carefully investigated and critically assessed to

single out those offering the best mechanisms with which to understand the fiscal impacts of the electoral systems when electoral systems are identified by their level of disproportionality at the interval (continuous) level. In this final section we summarise the discussions and present conclusions. Results of this review are summarised in table 2.4.

2.4.1 The general validity of the theories

In the previous sections, the general and specific assumptions and design aspects of different theories were criticized. Here we present a summary of common issues in the surveyed theories.

A flat tax rate and balanced budget are both assumed by most of the theories introduced in this review. Only those theories that offer less-elaborated explanations are free from this assumption.⁴³ This is a widespread deficit in the literature. In reality, only a limited number of jurisdictions (most being countries that formed the former Communist Bloc) apply a universal flat income tax rate. Budget imbalance (often in the form of a budget deficit) is also a common occurrence across the world.

Non-regressivity of the redistribution system is a key empirical inference. Based on empirical observations among the OECD members, no country experiences an inequality increase as a result of public social spending. Some theories explicitly guarantee non-regressivity: including Iversen and Soskice (2006), Meltzer and Richard (1981), Pontusson and Rueda (2008), and Lupu and Pontusson (2008). Some do not explicitly assume non-regressivity, but do not necessarily violate it either. These theories include Gallego (2010), Lizzeri and Persico (2001), Kontopoulos and Perotti (1999, 2002), and the consumer-producer framework. Finally, some models overtly violate this assumption, including modified universalism, geographic targetability, Milesi-Ferretti et al. (2002), Persson and Tabellini (1997, 1999, 2000), Debowicz et al. (2016, 2018), the coalition effect, Bawn and Rosenbluth (2003, 2006), Persson et al. (2003, 2007), and the veto points argument.

The fully-informed and rational voters is an assumption widely used in the voter-centred theories of the economic impact of electoral systems. The median-voter and class alliances frameworks Meltzer and Richard (1981), Pontusson and Rueda (2008), Iversen and Soskice (2006) explicitly assume the assertion, whereas the income bias of the turnout theory of Gallego (2010) makes implicit use of it by assuming a left-wing inclination among low income voters. Lizzeri and Persico's (2001) theory is the only one outside the voter-centred class of theories that implicitly makes this assumption. In comparison, theories that are founded on the assumption of near-perfect information and the rationality of politicians are less vulnerable to criticism because politicians are often a smaller group of actors who are relatively well-resourced and have a superior access to relevant information compared to the voters. Also, the voters are a large mass of people with heterogeneous interests and a more complicated relationship with politics, whereas professional politicians are structured in more coherent interest groups (parties) and follow common institutional rules and procedures of access to

⁴³ Meltzer and Richard (1981); Pontusson and Rueda (2008), Lupu and Pontusson (2008), Gallego (2010); Scartascini and Crain (2002); Mukherjee (2003); Crepaz and Moser (2004); Rogowski and Kayser (2002); Chang, Kayser, Linzer and Rogowski (2011).

power. As such, the second group's behaviour is more likely to fulfil the full-information and rationality assumption (Dalton and Anderson 2011, 242).

Three class division. Four models in the literature are constructed on the idea of dividing the voters into three economic classes: poor (low income), middle income and rich (high income). Classes are considered to be of equal size in Iversen and Soskice (2006), Persson and Tabellini (1997, 1999, 2000), Debowicz et al. (2016, 2018), and vary in size between 25% and 50% of the voting population in Ticchi and Vindigini (2010). Each group in these theories is hypothesised to be internally homogenous and externally represented by one party. From a social economics perspective, we know that the notion of the higher (rich) class (aka the capitalist class or the bourgeoisie) as a relatively homogenous interest group is applied to a tiny fraction of the population with claim to ownership of the means of production. This concept is at best applicable to 2-5% of the population, which given its size, is electorally insignificant compared to the middle class and the working class, each consisting of almost half of the voters. Theories that split society into equal economic classes with exclusive political representation do not clarify on the basis for this division.

Uniform electoral participation rate. The difference in voters' rate of participation between different income groups is a known empirical observation. Many theories have not incorporated this, but they are not dependent on it in their arguments either. However, the hypothesised causal mechanisms in theories that use a class framework in their explanations may be disrupted by electoral participation differentials rendering them invalid.

Oversized coalition: the entire family of universalist theories are founded on the idea of oversized or even all-encompassing coalitions, which was criticised in section 2.3.1. Also, as a result of using the class division approach, theories by Iversen and Soskice (2006), and Ticchi and Vindigini (2010) inevitably assume oversized coalitions between parties that represent two classes of voters with more than 50% of the vote. Neither offers an explanation or empirical evidence for the corollary that governments under the proportional system represent a larger population or include a larger share of the legislature seats compared to governments under majoritarian rule. By the same token, none of these theories can explain a minority government that is more likely to emerge under proportional settings.

Government partisanship: all voter-centred theories, except for Lupu and Pontusson (2008), as well as the consumer-producer theory, hypothesise a relationship between the type of electoral system and the likelihood of left-wing (pro-spending) government. These theories assume the position of parties regarding the redistribution question as fixed. Politician-centred theories, on the other hand, explain and model changes in the spending incentives of all parties in response to implications of the electoral rules, and hence, more generally hold that all parties are more likely to spend more under a proportional system than under disproportionality. Empirical evidence (for example, ParlGov database; see Döring and Manow 2018) attest that left-wing governments are not necessarily more frequent under the proportional systems especially when democratic, developing countries are brought into the picture. This implies that politician-centred theories that compare the centre of gravity of the political system under different electoral rules may offer more reliable explanations because the validity of their hypothesised relationships is independent of temporal change in the government's left-right partisanship.

Multi-dimensionality of policy space: elections are often contested over various issues other than just a redistributive policy. Yet, most of the theories in the literature rely on the

assumption of a uni-dimensional policy space where voters and candidates are solely concerned with the level of social spending. Only the coalition effect theories and geographic targetability models of Persson and Tabellini (1997, 1999, 2000) and Debowicz et al. (2016, 2018) allow for policy multi-dimensionality in the form of voters' ideological bias towards parties and heterogeneous demands of party constituencies. But even in these cases, higher targeted spending is introduced as the mechanism with which parties can buy more support from their voters. Further, multi-dimensionality often comes in the models as a compromise on the non-regressivity condition.

Electoral dynamics: an important aspect of how electoral rules affect the behaviour of voters and politicians is the level of uncertainty and rivalry they induce during the electoral process and the accompanying uncertainty afterwards in government formation and coalition maintenance. These dynamics are totally missing in theories with less-developed parametric models. Even worse, in other theories, the proposed causal mechanisms leave no room for either forms of uncertainty, and picture a deterministic electoral process in which outcomes are predetermined by the composition of voter and party preferences.

Meltzer and Richard (1981), Pontusson and Rueda (2008), Ticchi and Vindigini (2010), Scartascini and Crain (2002), Mukherjee (2003), Kontopoulos and Perotti (1999 and 2002), and Bawn and Rosenbluth (2003 and 2006) disallow electoral competition in their models, whereas Iversen and Soskice (2006), Persson and Tabellini (1997, 1999, 2000), Debowicz et al. (2016, 2018), Lizzeri and Persico (2001), Persson, Roland and Tabellini (2003, 2007) leave no room for post-election uncertainty; Milesi-Ferretti et al. (2002), Rogowski and Kayser (2002), and Chang et al. (2011) allow for neither.

Consistency between electoral and party systems: theories that hypothesise a two-party competition regardless of the electoral system are the main examples of 'electoral system'- 'party system' inconsistency. Meltzer and Richard (1981), Pontusson and Rueda (2008), Persson and Tabellini (1997, 1999, 2000), Debowicz et al. (2016, 2018), Lizzeri and Persico (2001), Rogowski and Kayser (2002), and Chang et al. (2011) may be placed in this group. By comparison, some theories allow for a categorical distinction between the number of parties (i.e. a two-party system under majoritarian rules and three or four parties under the proportional alternative). These theories at least comply more closely with the reality, yet are not fit for the purpose of this study, which is to deal with electoral disproportionality as a continuous variable. Iversen and Soskice (2006), Ticchi and Vindigini (2010), and Crepaz and Moser (2004) are included in this group.

On the opposite end of the comparative scale, theories of modified-universalism by Scartascini and Crain (2002), and Mukherjee (2003), along with theories in the coalition effect school, incorporate the effect of party fragmentation in full in their explanatory mechanism and hence seem to be the closest to address the main research question of this study.

Table 2.4

A summary of the schools and theories explaining the impact of electoral systems on public social spending

Category	Class	Author(s)	Approach(es)	Core idea(s) and Argument	Key nexus	Party fragmentati on variable	Other model specifications	Conclusion Type
Voter-centred theories	Median voter model	Meltzer and Richard (1981) Pontusson and Rueda (2008)	Median-voter framework	The more unequal a society is the higher would be the demand for social spending	Economic distance between the median voter and the lower class	2-party competition	Self-centred, profit maximizing voters Fully informed voters Uni-dimensional policy space Single-peaked voter preferences Non-regressivity Balanced Budget No taxes on capital gains or property ownership	Government partisanship
	Class alliances framework	Iversen and Soskice (2006)	Median-voter framework	Possibility of default on coalition platform once in power, pushes the middle class voters to vote for the higher class party but lack of this threat urges them to form a post-election coalition with the lower class party	Possibility of platform default	At categorical level	Informed rational voters 3 classes of equal size Uni-dimensional policy space Sincere voting under PR and tactical voting under MJ Oversized-coalition under PR Possible platform default Non-regressivity Flat tax rate Balanced budget	
		Lupu and Pontusson (2008)	Class alliances framework	Middle-income voters will be inclined to ally with low-income voters and support redistributive policies when the distance between the middle and the poor is small. Centralized wage bargaining which is an effect of PR systems reduces this distance.	Centralized wage bargaining	Not included	Non-regressivity	Political centre of gravity
		Ticchi and Vindigini (2010)	Median-voter framework (MJ) Direct effect of electoral system (PR)	Under MJ government is always won by the higher class which prefers no redistribution but under PR it is always run by a coalition of class parties poorer than the higher class and hence more inclined for social spending	Bargaining power of the lower class	At categorical level	3 classes, none larger than 50% of the population Heterogeneous participation rate of classes Uni-dimensional policy space Sincere voting under PR and tactical voting under MJ Oversized-coalition under PR Coalition uncertainty under PR Flat tax rate Balanced budget No public good for classes outside government	Government partisanship

Table 2.4 cont.

Category	Class	Author(s)	Approach(es)	Core idea(s) and Argument	Key nexus	Party fragmentation variable	Other model specifications	Conclusion Type
Voter-centred theories	Class bias of electoral turnout	Gallego (2010)	Class bias of electoral turnout	Electoral competitiveness The income bias of the turnout More proportionality increases the electoral participation of the poorer voters who are more pro-redistribution so this increases the likelihood of left government and higher social spending	Non-Uniform electoral participation rate of the classes	Not included		
Politician-centred theory	Universalistic decision making	Weingast (1979)	Universalistic decision making	In majoritarian electoral systems, uncertainty over re-election leads to “universalistic” decision making over matters of spending and redistribution	Law of 1/N Partial internalization of the costs of local spending	Non-partisan	Rational voters and politicians Uni-dimensional policy space All-encompassing coalition Coalition uncertainty Only geographically targetable spending Flat tax rate	Political centre of gravity
		Weingast, Shepsle and Johnsen (1981)		Universalism in majoritarian systems increases the level of government spending on ‘public goods’ beyond efficiency because the cost of local projects in SMDs is only partially internalized by decision makers at equilibrium			All-encompassing coalition Only geographically targetable spending Coalition uncertainty	
		Inman and Fitts (1990)		Disciplinary role of the parties Constrained universalism Under MJ level of social spending is curbed by the size of the ruling coalition, the role of the political parties and the veto power of the presidents (where they exist). The contained level of spending is still inefficient			Oversized coalition Only geographically targetable spending Coalition uncertainty	
		Scartascini and Crain (2002) Mukherjee (2003)		Modified-Universalism More parties induces higher coalition uncertainty and leads to oversized coalitions and hence higher public spending		Fully included	Rational legislators All-encompassing coalition Coalition uncertainty	

Table 2.4 cont.

Category	Class	Author(s)	Approach(es)	Core idea(s) and Argument	Key nexus	Party fragmentati on variable	Other model specifications	Conclusion Type
Politician-centred theory	Geographi c targetabilit y approach	Persson and Tabellini (1997, 99 & 2000) Debowicz, Saporiti and Wang (2016 & 2018)*	Electoral geography Median-voter framework Electoral equilibrium	Under MJ electoral competition concentrates in marginal districts which are middle class seats * Altruistic voting	Geographic concentration of electoral competition	2-party competition	3 classes of equal size Uniform electoral participation Geographical concentration of classes under MJ Multi-dimensional policy space Electoral Uncertainty No coalition uncertainty Possible regressivity Flat tax rate Balanced Budget	Political centre of gravity
		Milesi-Ferretti, Perotti and Rostagno (2002)	Electoral geography	Under PR vote of two social groups is to be sought to win government whereas under MJ vote of two districts is to be sought so Level of local public spending is higher under MJ and level of socially targetable spending is higher under PR	Type of social expenditure necessitated by the electoral structures	Not included	3 social groups none larger than 50% or smaller than 25% of the population One class is dominant in two districts under MJ 3 electoral districts under MJ Allows for heterogenous group participation rates Uni-dimensional policy space No electoral uncertainty No coalition uncertainty Possible regressivity Flat tax rate Balanced budget	
		Lizzeri and Persico (2001)	Targetability of social spending	Variable utility of universal public good between elections Likelihood of provision of local public good is 0.5 under MJ but is a direct function of its utility under PR	Utility of universal public Good Incentive to minimize waste vote	2-party competition	Fully rational voters and politicians Platform commitment Uni-dimensional policy space Universal utility of local public good Pure strategies (either public good provision or redistribution) Electoral uncertainty No coalition uncertainty Local taxation and redistribution Balanced budget	

Table 2.4 cont.

Category	Class	Author(s)	Approach(es)	Core idea(s) and Argument	Key nexus	Party fragmentation on variable	Other model specifications	Conclusion Type
Politician-centred theory	The Coalition effect approach	Kontopoulos and Perotti (1999 & 2002)	Common pool problem within the coalition	Problem of internalizing the cost of spending in coalition	Level of executive fragmentation	Fully included	MWC Multi-dimensional policy space	Political centre of gravity
		Bawn and Rosenbluth (2003 & 2006)		Spending is targetable to social groups represented by coalition partners under PR but not under MJ. So less of the costs are internalized by coalition partners and since coalition are more common under PR, social spending is higher under this system.	Degree of internalization of spending costs		MWC N social groups of equal size Uniform electoral participation Multi-dimensional policy space Platform commitment No electoral uncertainty Coalition uncertainty Possible regressivity Flat tax rate Balanced budget	
		Persson, Roland and Tabellini (2003 & 2007)	Common pool problem within the coalition Systemic electoral conflict between coalition partners	Parties in coalition have to overspend on their own constituencies because those constituencies are electorally more responsive. Since coalitions are more common under PR than under MJ this increases the level of spending under PR.	Electoral responsiveness of voter groups Level of executive fragmentation Frequency of coalition government	Fully included (at cabinet level)	MWC, no minority government 4 social groups of equal size Homogeneous SMDs under MJ Multi-dimensional policy space Socially-targeted spending Unilateral decision power within the coalition Limited electoral uncertainty No coalition uncertainty Possible regressivity Flat tax rate Balanced budget	
	The “veto points” argument	Crepaz and Moser (2004)	Collective vs. competitive veto points	Personalized vs. institutionalized blame Morality of duty Logrolling The need to maintain the coalition and the higher visibility of political actors weakens mutual control of coalition partners over each other's spending.	Frequency of coalition government	At categorical level	Coalition uncertainty Possible regressivity	
	The consumer-producer framework	Rogowski and Kayser (2002) Chang, Kayser, Linzer and Rogowski (2011)	Direct effect of electoral system	Competition between consumer and producer classes Responsiveness of electoral systems Higher responsiveness of MJ system causes the pro-consumer parties to win the election. The opposite is true under the PR system.	Difference in vote-seat elasticity between electoral systems Degree of electoral power of the consumer class	2-party competition	Uni-dimensional policy space No electoral uncertainty No coalition uncertainty	Government partisanship

2.4.2 The key nexus between electoral disproportionality and social spending.

Based on the survey results, most theories have so far only dealt with a comparison between electoral systems at the binary level (i.e. proportional vs. majoritarian). Only a minority of the theories view the difference between the proportional system (as an ideal type) and deviation from proportionality as a question of degree on an interval scale (Scartascini and Crain (2002), Kontopoulos and Perotti (1999, 2002), Bawn and Rosenbluth (2003, 2006) and Persson, Roland and Tabellini's (2003, 2007)).⁴⁴

However, there are few theories that suggest mechanisms involving continuous variables that might be understood as endogenous to the electoral dynamics and hence correlated with change in the degree of proportionality of the electoral system. Lupu and Pontusson (2008) suggest the degree of centralised wage bargaining as the intermediary variable bridging the electoral system and the level of social spending. Gallego (2010) proposes the relative rate of electoral participation by the lower class to be the proper causal path. If Gallego's proposal is valid and it is correct that the poorer voters are more likely to vote for pro-redistribution parties, then Ticchi and Vindigini's (2010) 'degree of bargaining power of the lower class' can be, by the same token, a valid intermediary variable too. Scartascini and Crain (2002), Mukherjee (2003), Kontopoulos and Perotti (1999, 2002), and Bawn and Rosenbluth (2003, 2006) identify the intermediary mechanism as being the degree to which the social spending costs are internalised by the decision-makers. According to this argument, the more the number of actors involved in the process, the less capable they are of internalising the costs of spending and the more they will spend in total. Closely related to this idea is Kontopoulos and Perotti's (1999, 2002) and Persson, Roland and Tabellini's (2003, 2007) variable called 'executive fragmentation'. Also, closely connected with these two suggestions is the likelihood of coalition government under different electoral systems, as proposed by Persson, Roland and Tabellini (2003, 2007) and Crepaz and Moser (2004). The degree of cost internalisation is itself dependent on the level of fragmentation of the ruling coalition while executive fragmentation and the likelihood of a coalition government are both known to be in relation with the degree of legislative fragmentation. But on top of being in relation with executive fragmentation, the degree of legislative fragmentation has an additional significance because it is also an indicator for the level of electoral competition in a democracy. We believe that the minimal inclusion of the idea of electoral competition is a gap in the literature and we aim to address this gap through this study.

Perhaps closest of all to be a systemic attribute of the electoral system is Rogowski and Kayser's (2002) and Chang, Kayser, Linzer and Rogowski's (2011) intermediary variable 'the difference in vote-seat elasticity between electoral systems'. The idea of vote-seat elasticity might seem to be a proper proxy for electoral proportionality. Yet, the way this concept is applied in the consumer-producer theory is very specific and in our view inconsistent with the idea of a correlate for electoral disproportionality. The seat share of parties in a proportional system is very elastic (responsive) to their vote share at all points. But in extremely disproportional systems, elasticity is not a linear character of the system, meaning that the seat share of parties is extremely elastic only around a threshold point and inelastic elsewhere. For example, in a two-party contest a party will gain no seats until it achieves 50% of the vote. At this point the

⁴⁴ It will be shown in chapter 6 (sec 6.2), that even those empirical studies that sought to probe into the relation between electoral proportionality and economic inequality, have used either improper indices or wrong measurement techniques for the measurement of the index.

system becomes highly elastic and awards the party the entire seats contested. When the party vote exceeds the 50% threshold, the system becomes unresponsive again, and the result does not change as a consequence of the change in the party's vote. As such, elasticity cannot be a unique identifier of a non-proportional electoral system. Further, the consumer-producer theory applies this concept to the two-party competition, which is not often the case under the proportional system.

Summing up, the assessed literature points to seven intermediaries that can establish a relationship between the interval level input (a character of the electoral system; e.g. electoral disproportionality) and the output of our research (the level of social spending or economic inequality). The last four of these intermediary variables may be clustered together since they are closely associated. This, leaves us with four categories which include:

1. The degree of centralised wage bargaining
2. The rate of electoral participation by the lower class
3. The degree of bargaining power of the lower class
4. The legislative fragmentation, executive fragmentation, the likelihood of coalition government and the degree of internalization of spending costs by coalition partners

The latter category, involves theories in the politician-centred family while the former three coming from the voter-centred family of theories elaborated in this chapter. Only theories in the latter category use interval level variables for the intermediary mechanism they hypothesise. In chapter 6, where we look at the role played by party diversification, it will be shown that empirical evidence is clearly in support of the validity of this group of theories at the macro-level.

2.4.3 Conclusion

In conclusion, theories that identify executive and legislative fragmentation as possible causes for the increase in the size of social spending seem to enjoy better model specifications and are afflicted with fewer issues based on our analysis. The three theories offered in the coalition effect school, along with the theory of modified-universalism are in this group and each bear certain elements of truth. The latter, however, must be taken into consideration with more care due to specific problems with the theory of universalism (see section 2.3.1).

Some theories remain at a higher level of generality and do not delve deeply enough into modelling their hypothesised causal mechanisms. For this reason they are more difficult to evaluate. Lupu and Pontusson's (2008) centralised wage bargaining, Gallego's (2010) income bias of the turnout, and Crepaz and Moser's (2004) veto points argument may be placed in this category. Among these, the latter also points to coalition dynamics (executive fragmentation) as a possible cause while the former two identify voting decisions of the lower class voters as the explanatory factor.

This conclusion hints at the importance of a full inclusion of the electoral competition in the models as a missing idea from the coalition theory and the entire literature in general. In the multi-party systems, constituencies of ideologically-similar parties overlap more than in the two-party systems. In other words, more parties have to compete over the same constituencies in the multi-party system. This, combined with the principle of non-regressivity, leads parties to be responsive to redistributive demands of a larger portion of the population.

Another way of interpreting the impact of party competition is by looking at the effect of accumulated dissatisfaction of the conduct of the government. Discontent with government, which may have its origin in a wide variety of reasons, even beyond its control, will accrue over time and erode the vote share of the ruling party or coalition. Under a two-party system the vote shift will be inevitably absorbed by the opposition party, whereas under proportionality, opposition parties have to compete for this vote. In fact, we argue that it is not the number of parties in government, but rather the number of parties in parliament that incentivises all parties to pledge to spend more to keep their competitors away from their vote base. This, puts the hypothesis of this study in close association with the fourth mechanism postulated in the literature for the relations between the electoral institutions and economic outcomes (listed at the end of the previous section). Chapters 5 and 6 will test the empirical validity of this hypothesis.

Chapter 3

Introducing a new index for the measurement of the vote-seat disproportionality in electoral systems

3.1 Introduction

For decades, the proportionality of electoral systems has been the subject of scholarly research in political science and political economy. A plethora of socio-economic outcomes have been partially attributed to the design of the electoral systems, and specifically to the level of proportionality between the party preferences of the eligible voters and the way these preferences are eventually translated into party representation in the parliament through the electoral system. Some examples include: the level and composition of taxation and social spending, economic and social inequality and corruption (Persson, Tabellini and Trebbi 2003) (see chapter 2), the stability of government and the party system (Lijphart 1994), the politicisation of ethnic cleavages (Huber 2012), and the decision-making dynamics of democracies.

Despite the fairly high level of attention given to the phenomenon, the conceptualisation and the measurement of disproportionality continue to challenge political scientists. Yet, despite the progress that has been made in this direction, existing proposals share one common and fundamental weakness: the lack of objectivity with regard to the actual behavioural adjustments of the voters. Theoretically speaking, proportionality is a systemic character of an electoral system. If disproportionality is represented by D , it may be defined as a function of the party composition of the parliament⁴⁵ (PCP) and the distribution of the party preferences of eligible voters ($PPEV$):

$$D = f(PCP, PPEV) \quad (3.1)$$

Viewed in this way, D is time-independent insofar as there is no change in the electoral rules.

⁴⁵ The scope of this dissertation is the lower house of national legislative assemblies in countries with unicameral or weak bicameral legislatures. However, in a broader sense, political representation involves the degree to which the state apparatus in its entirety is run by the parties or coalitions that have the highest popularity among the eligible voters in any given electoral cycle or in a narrower sense among participants in the elections. As such, instances of conflict of representation between the legislative and the executive (i.e. presidential systems) or compositional disparity in bicameral parliaments with strong upper houses are also examples of the lack of proportionality for which more inclusive indices of disproportionality need to be proposed and measured in the future.

Now, if disproportionality is to be measured using data from actual elections, at least two types of distortions caused by the electoral system may not be accounted for. The first is the discrepancy between PPEV and the party preferences of actual voters (*PPEV*).⁴⁶ It is argued in the literature that in established and developed democracies, different electoral systems are associated with different levels of turnout (Cox 2015, Selb 2009, Blais and Aarts 2006, Grofman and Selb 2011, Gallego 2010, Rico and Anduiza 2011). Further, if we take the actual voters as a sample of the voting-eligible population, it is also shown that this sample is not representative of the population and is generally more likely to lean to the right of the political spectrum compared to the population (Lijphart 1997, Franko, Kelly and Witko 2016, Nagler and Leighley 1992, 2007 and 2014, Gallego 2010). To put it simply, empirical measurement reveals the disproportionality between the distribution of parliamentary seats and the preferences of actual voters and rather than the preferences of the entire voting-eligible population. This is while, as shown in the previous chapter, the electoral system is itself an influential factor in determining the rate of turnout.

Secondly, when an electoral system is implemented in an actual election, the outcome may not be a correct reflection of its true disproportionality because voters adjust their preferences and vote differently from what they otherwise would have, in response to their expectations of how votes for different parties (e.g. large or small, locally concentrated constituency or nationally dispersed base) are being differently weighted by the electoral system in determining the election outcome. In other words, voters usually vote for the parties or coalitions that they believe will have a meaningful chance of winning sizable or crucial parliamentary representation which is, in part, determined by the role of the electoral system in translating votes into seats. In fact, in choosing between the lesser of the two evils (their votes being wasted or voting for their less favourable party), voters unwittingly reduce the level of disproportionality by opting for the former and adapting their behaviour to the constraints of the electoral system by voting for the winnable candidates/parties. If composition of the vote is shown by V , then the time varying relationship between *PPEV* and V may be shown as:

$$V_t = f_{turnout}(g_{turnout\ composition}(h_{strategic\ voting}(PPEV_t))) \quad (3.2)$$

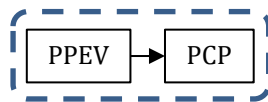
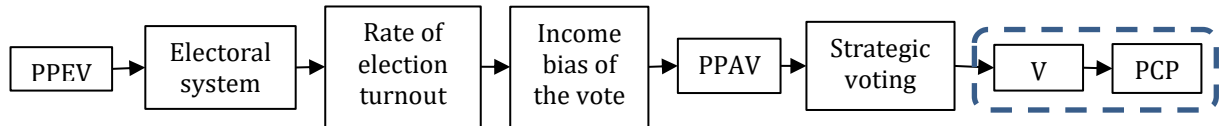
And the measurement of the disproportionality using the election data can be expressed by the following formula:

$$D = \overline{f(PCP_t, V_t)} \quad (3.3)$$

D in formula (3.3) is only a time-average approximation of D as measured by formula (3.1).

Almost all existing methodologies measure disproportionality by looking at the election data. When measured in this way, proportionality always (and in certain cases significantly) remains underestimated.

⁴⁶ These issues will be addressed in chapter 6.

Theoretical measurement of disproportionality*Empirical measurement of disproportionality***Figure 3.1**

Discrepancy between the measurement of disproportionality using theoretical and empirical approaches

The problem becomes manifold when we realise that different electoral systems offer different possibilities for the behavioural adjustment of the voters. In the majority bonus system (e.g. Greece and Italy), disproportionality is introduced only after the vote count by granting extra seats to the winning party in order to gain a predefined percentage of the total seats. This renders it impossible for the voters to change their voting tactics at the time of casting their ballot. Alternately, systems with quotas of seats for subgroups in the population (e.g. Bosnia and Herzegovina) limit the voters' choice to a sub-section of all parties and in a sense distort the outcome of the election, thereby not reflecting the true preferences of the voters. In New Zealand's mixed-member proportional system, electors are given two ballots: one to vote for their local electorate and one to determine the overall composition of the parliament. In the instance of an overhang (i.e., when a party wins more electorate seats than it would have based on its party vote), the extra electorate seats are awarded to that party without adjustment to the seat shares of other parties. This possibility opens the door to tactical voting whereby voters cast different electorate and party votes (Riera and Bol 2017). These differences mean that similar levels of disproportionality, measured from the election outcome data, may indicate different degrees of behavioural adjustment among the voters, rendering the comparison between electoral systems problematic.

Another related aspect is that the degree of decrease in disproportionality as a result of the voters' adjustment (of their voting decisions) in response to the electoral system's manipulation of electoral incentives varies across different categories of electoral systems. While, in theory, majoritarian systems are by definition more disproportional than semi-proportional or proportional systems, in practice, sometimes they better disguise disproportionality in a real election by offering voters more incentives for behavioural adjustment. To make this point clearer, figure 3.2 presents a hypothetical example of two electoral systems: one allowing for more proportionality than the other. When disproportionality is measured using the empirical method, the change in voters' behaviour reduces the disproportionality of the results in the majoritarian system by 40% and in the proportional one by only 33.3%.

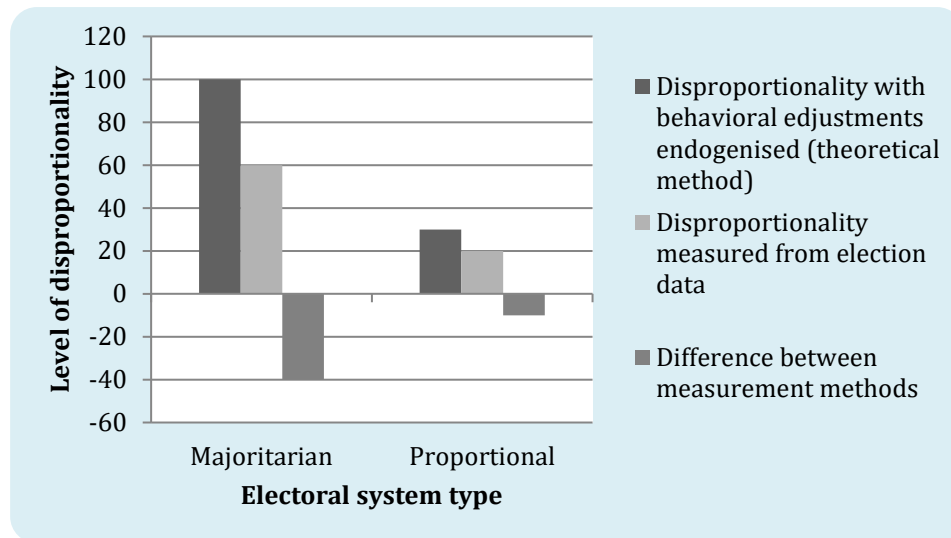


Figure 3.2

Two hypothetical electoral systems with varying degrees of decrease in vote-seat disproportionality due to voter's behavioural adjustment when measured using the election data

The illustration above is intended to show that the amount of error introduced in the empirical measurement of proportionality differs according to context. To be more precise, in the empirical approach, the magnitude of underestimation of disproportionality varies across electoral system types. More importantly, this underestimation error lacks a predictable pattern because, in empirical measurement, it is not possible to single out the amount of disproportionality caused by the voters' tactical voting.

This chapter is intended to address the question of the measurement (of proportionality) from a theoretical perspective that enables the isolation of the effect of behavioural adjustments on election results. It proposes a novel approach that also allows for the decomposition of disproportionality along different aspects of an electoral system such as entry threshold, district magnitude and vote count formula). This approach transcends the existing disproportionality methodology in two ways: first, by setting a universal reference point to make country cases comparable despite their different demographic contexts; and second, by enabling the measurement of disproportionality to be more precise. By allowing for decomposability, it will also provide a more objective understanding of the impact of various elements of the electoral system design on the level of disproportionality that was hitherto discussed only from a qualitative perspective in the literature.

In the following sections, first the literature on disproportionality measurement will be reviewed to introduce the indices proposed by previous studies. We categorise these indices under several families and enumerate the merits and limitations of each (section 3.2). Section 3.3 selects the best among these indices by reviewing their strengths and shortcomings. Finally, section 3.4 offers a modified index for the measurement of electoral disproportionality.

3.2 Existing measures of electoral disproportionality

Various indices have been proposed to address the issue of measuring the disproportionality of electoral systems. Taagepera and Grosman (2003) list 19 indices created since the late 1960s. A few more may be found in Kestelman (2005) and Karpov (2008). When considering the categorisation offered by these researchers, we believe that these indices could be categorised in a different way to better represent their nature and make their merits and disadvantages more comparable. Three families of such indices may be devised. Before presenting these families, we need to introduce two measures of disproportionality at the party level; these are the building blocks of nearly all existing indices of disproportionality:

- 1) The absolute distance between vote share and seat share of a party (Δ_i) which may be expressed either in percentages or as a fraction:

$$\Delta_i = |v_i - s_i| \quad (3.4)$$

v_i and s_i are the percentages of vote and seats gained by party i respectively.

- 2) *Party advantage ratio* (A_i) proposed by Taagepera and Shugart (1989) and is defined as the seat share of a party in an election divided by its vote share.

$$A_i = \frac{s_i}{v_i} \quad (3.5)$$

If these shares are equal, then $A = 1$. If a party gains more seats than its share of the votes, then it is advantaged by the electoral system and $A > 1$. The opposite is true when a party is allocated fewer seats than its share of the votes.

If A is shifted one unit to the left to be centred around 0 instead of 1, we arrive at A^0 which we call the *zero-centred advantage ratio*. A^0 is defined as:

$$A_i^0 = \frac{s_i}{v_i} - 1 \quad (3.6)$$

Now we can present our categorisation based on the introduced concepts. It should be noted that the calculation of all indices includes all participating parties in the election unless explicitly stated otherwise.

3.2.1 Indices based on the seat share-vote share differentials of the parties (Δ)

A majority of the indices of disproportionality utilise the Δ concept in their construction. All of these indices have a positive finite range between 0 and a number close to 1.

The most popular index for disproportionality is the D index which takes the following form:

$$D = \frac{\sum_{i=1}^{parties} \Delta_i}{2} \quad (3.7)$$

According to Taagepera and Grofman (2003), this index was adopted to the context of disproportionality studies by Loosemore and Hanby (1971). For every party that gains an extra

share of the seats, other parties combined lose an equal share. Thus, since the summation of Δ_i takes place over all parties, the sigma should be divided by 2 to achieve an accurate result.⁴⁷

D may be interpreted as an inequality index of disproportionality because it represents the percentage of seats that are apportioned contrary to the distribution of the votes among parties. If all seats are allocated proportionately, the value of D would be 0 (or 0%), and if all are allocated disproportionately, D would be 1 (or 100%). However, such an index measures only the transfer from the disadvantaged parties to the advantaged parties in the apportioning of the seats to votes and is insensitive to the transfer between gaining parties (Fry and McLean 1991). To counter this limitation, alternative inequality measures of proportionality have been proposed (Gini index of disproportionality and the Taagepera and Shugart index), which will be explained shortly.

D is also criticised for being overly sensitive to the number of parties (Lijphart 1994; Taagepera 2007, 79). To tackle this problem, Rae (1967) proposed that the denominator be replaced by the total number of parties with a vote share above 0.5 % (here shown as P):

$$I_{Rae} = \frac{\sum_{i=1}^{parties} \Delta_i}{P} \quad (3.8)$$

Monroe (1994, 139) rightly argues that: "This index is probably worse" as it "is extremely sensitive to the addition of small parties to the system, and it is improperly bounded."

A variant of Loosemore and Hanby's D formula was suggested in Lijphart (1984), consisting only of the average distortion from proportionality of seats of the first two parties with the largest vote:

$$I' = \frac{\sum_{i=1}^2 \Delta_i}{2} \quad (3.9)$$

This may be seen as another response to the criticism that D is over-sensitive to the number of smaller parties. However, this initiative too, underestimates disproportionality when the pattern of malapportionment of the seats to votes includes several other major parties besides the two leading ones in an election.

Grofman and Taagepera (2003) proposed another modification to D in the Grofman index that appeared in the mid-1980s. This index is defined as:

$$Gr = \frac{\sum_{i=1}^{parties} \Delta_i}{N_v} \quad (3.10)$$

In this formulation, P is replaced by *the effective number of elective parties* (N_v) in accordance with the widely accepted index of fragmentation of the party system devised by Laakso and Taagepera (1979):

$$N_v = \frac{1}{\sum_{i=1}^{parties} v_i^2} \quad (3.11)$$

⁴⁷ R = 1- D is defined as the Rose index (1984) which is an established measure of proportionality. (P. Kestelman)

where v_i is the vote share of parties participating in the election. The more distributed is the vote among parties, the higher will be the N_v . Its minimum value is 1, occurring when the entire vote is concentrated in a single party.

Since the choice of N_v has not been explained, we speculate that it draws on the observed relationship between proportionality and higher fragmentation. So the index of disproportionality is deflated by the application of N_v in the denominator wherever the fragmentation is higher (i.e., a proportional electoral system). If that is the reasoning behind this choice of N_v , we believe that it does not serve the purpose well because some low proportionality electoral systems such as the *Majority Bonus System* (see section 5.6.4) also correspond with high fragmentation typical of more proportional systems. The reason is that the criterion for seat-vote malapportionment in this system is largely void of information content for the voters at the time of casting their ballots. As a result, this index tends to underestimate the disproportionality for such electoral systems.

Lijphart (1994) proposes the largest discrepancy between vote-share and seat -share in an election as an index of disproportionality on the grounds of its simplicity of calculation:

$$L = \max \Delta_i \quad (3.12)$$

The formula indicates the largest vote-seat discrepancy of all participating parties in an election. Clearly though, L heavily underestimates disproportionality wherever it is due to a less skewed vote-seat malapportionment pattern, rendering the index inferior to D . This underestimation is illustrated in Figure 3.3 with two hypothetical elections: one with a left skewed malapportionment of seats to votes (left pane) and the other with a non-skewed malapportionment pattern (right pane). In the former, a good part of the misallocation is concentrated in the first two parties, resulting in a high L index (8% in this example). In the latter allocation, while the malapportionment is equally bad, because malapportionment has a more homogenous distribution among parties, the L index estimates a lower disproportionality of only 5%.

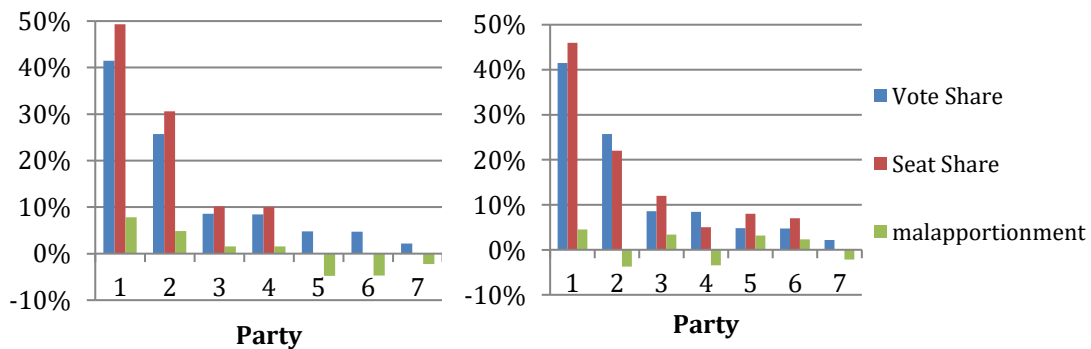


Figure 3.3

Different levels of skew in the patterns of vote-seat malapportionment

Note: Data for the left pane is from German federal elections 2013. The right pane distributions are hypothetical

Another index in this family is proposed by Li (1995) and rests on the idea of weighting individual party malapportionments by the vote share (v_i) of the respective party.

$$PWI = \sum_{i=1}^{parties} v_i \times \Delta_i \quad (3.13)$$

This index reflects the vote share of party i in a given election multiplied by the difference in its vote share and seat share, implying that the higher vote share of a party makes its vote-seat discrepancy more important in the calculation of the index. However, if one accepts the premise that each political party has its own unique function in the political system, it would not be easy to see the justification for over-weighting the face value of malapportionment for parties with larger vote shares.

An alternative index is proposed by Gallagher (1991) and is defined as:

$$Gh = \sqrt{\frac{\sum_{i=1}^{parties} \Delta_i^2}{2}} \quad (3.14)$$

The logic behind this formula is similar to the notion of *sum of squared errors* (SSE) in regression analysis whereby the distance of each point from its predicted value based on the regression line is used to calculate the measure for the goodness of the fit of the regression model (R^2). Gh presents the measurement of disproportionality as a form of statistical error. The key feature of this index is that it registers a few large deviations much more strongly than a lot of small ones (Kalogirou 2000, 65).

Finally, a modification of Gh is the D_p index proposed by Monroe (1994). He introduced this index as a measure of the deviation of disproportionality:

$$D_p = \sqrt{\frac{2 N_v}{N_v + 1}} \times Gh \quad (3.15)$$

The advantage of this formula compared to Gallagher's index is its normal range (0,1).

3.2.2 Indices based on the party advantage ratios (A or A⁰)

This family consists of six indices all with infinite ranges. The D'Hondt index is the simplest in this family and was proposed in Gallagher (1991, 43) as the maximum of the advantage ratios (formula 3.5) among the parties:

$$D'Hondt\ Index = \text{Max } A_i \quad (3.16)$$

Similar to the L index (formula 3.12), the problem with this formula is that it is less sensitive to an even distribution of malapportionments among parties than when the distribution of malapportionments is concentrated among parties with smaller (or larger or average) vote shares.

The other five indices in this family were all proposed in Pennisi (1998). The first three measures are built on the notion of the cost of a seat. Under proportionality, the cost of obtaining one seat in the parliament is shown as $C = \frac{\text{Total Seats } (S)}{\text{Total Votes } (V)}$. For example, in a parliament with 200 seats, 2% of the vote is needed to gain one seat. The cost paid by party i to gain a seat under an electoral system is defined as the share of its seats (s_i) divided by the share of its votes (v_i): $c_i = \frac{s_i}{v_i}$. Three indices are defined utilizing this concept: L_1 , L_2 and L_∞ . They are defined as below:

$$L_1 = \frac{S}{V} \times \sum_{i=1}^{parties} |A_i^0| = \sum_{i=1}^{parties} |C - c_i| \quad (3.17)$$

$$L_2 = \left(\frac{s}{v}\right)^2 \times \sum_{i=1}^{parties} A_i^0{}^2 = \sum_{i=1}^{parties} (C - c_i)^2 \quad (3.18)$$

$$L_\infty = \frac{s}{v} \times \max |A_i^0| = \max |C - c_i| \quad (3.19)$$

These formulations are easier to understand using the concept of seat cost. The first two measure the overall deviations in the cost of obtaining a seat for all parties from the average cost of obtaining a seat, whereas the last one focuses only on the party that faces the strongest discrimination, i.e. the party that pays the highest cost to obtain each of its seats.

Pennisi (1998) also offered an entropy formula for disproportionality:

$$Entropy = \sum_{i=1}^{parties} (s_i \times \ln A_i) \quad (3.20)$$

Again, s_i is the seat share of party i . This index is explained as “the degree to which we are surprised when informed that the votes of the parties are replaced by the seats they have been awarded. Voters will generally prefer to be surprised as little as possible!” (Pennisi 1998, 8). It may also be understood as a summary of the seat costs of all parties weighted by the number of seats gained by each. This is problematic because in the common instance of vote-seat malapportionment resulting in some parties gaining no seats at all, malapportionment related to those parties may be omitted in the calculation of the index ($\ln \frac{0}{v_i} = \ln 0$ is undefined).

As noted before, all of the above indices suffer from the lack of an upper limit.

The last index that utilizes advantage ratios is the Gini index of disproportionality. This index is an alternative attempt to apply the methodology of measuring economic inequality to the field of electoral studies by addressing the criticism that D is not sensitive to the transfer between subsidised parties ($A_i > 1$) (Fry and McLean 1991, 55). The Electoral Gini index is calculated by sorting parties in ascending order of their advantage ratios and plotting their cumulative seats gained in the election against their votes (known as the Lorenz curve). In this way, we will have a concave graph similar to the income plot for Gini (Pennisi 1998, 8). The 45° line is the $\frac{s}{v}$ line when s and v are both normalised; that is, when each party receives a seat share proportionate to its vote share. The Gini ratio is then defined as the area between the 45° line and the Lorenz curve for $\frac{s}{v}$. (see figure 3.4)

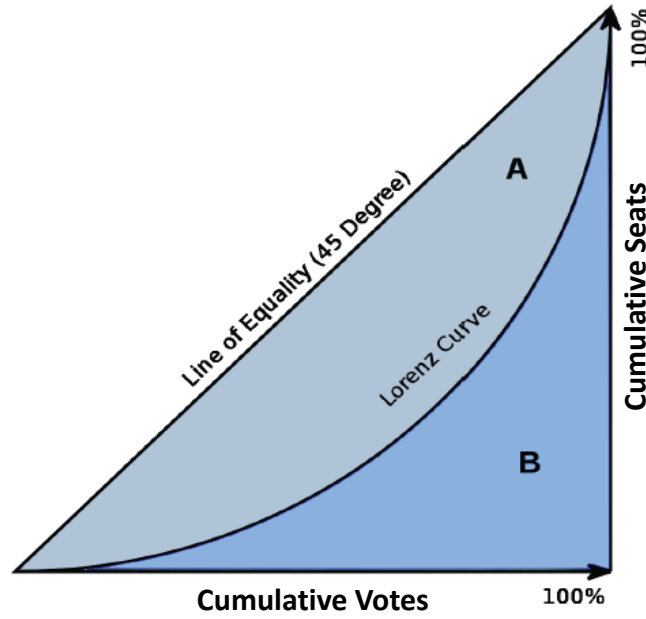


Figure 3.4
Application of the concept of Gini to electoral disproportionality

A parametric formulation of the above definition amounts to the formula below for the Gini index of disproportionality:⁴⁸

$$G = \frac{A}{A+B} = \frac{(A+B)-B}{A+B} = \frac{\sum_{i=1}^P v_i \sum_{j=1}^i v_j - \sum_{i=1}^P v_i \sum_{j=1}^i s_j}{\sum_{i=1}^n v_i \sum_{j=1}^i v_j} \quad (3.21)$$

where P is the number of parties. In this formula, $\sum_{i=1}^n v_i \sum_{j=1}^i v_j$ represent the $A+B$ area in figure 3.4 and $\sum_{i=1}^n v_i \sum_{j=1}^i s_j$ represents area B .

3.2.3 Indices based on Δ and $(A \text{ or } A^0)$

A distinct group of indices applies the chi-square concept to the calculation of disproportionality in various forms (Nagel 1984; Gallagher 1991). The first formulation is:

$$\chi^2 = \sum_{i=1}^{parties} \frac{(v_i - s_i)^2}{v_i} = \sum_{i=1}^{parties} (A_i^0 \times \Delta_i) \quad (3.22)$$

This index is based on the definition of a chi-squared test whereby:

⁴⁸ Gini is also defined in Pennisi (1998) as:

$$Gini = \frac{1}{2VS} \sum_{i=1}^n \sum_{j=1}^n |A_i - A_j|$$

and in Kestelman (2005) as:

$$Gini = \frac{1}{200} \sum_{i=1}^n \sum_{j=1}^n |v_i s_j - v_j s_i|$$

Both of these formulas draw on the mathematical notion of relative mean absolute difference mentioned in Sen (1977:31). Yet they are apparently different and neither gives the same value as that produced by the Gini graph-based calculation.

$$\chi^2 = \sum \frac{(\text{Expected value} - \text{Observed value})^2}{\text{Expected value}} \quad (3.23)$$

It gives a measure of similarity between the distribution of seats and the distribution of votes in an election. Yet χ^2 is not as intuitively interpretable as either D or G . It is also not bounded in range.

Normalisation was tried on Chi-square measure by Mudambi (1997) using the statistical likelihood of an election's chi-squared result to occur. Mudambi proposes the following formulation:

$$\text{disproportionality} = 1 - p[t < \sum_1^{P-1} (A_i^0 \times \Delta_i)] \quad (3.24)$$

where P is the total number of parties. Yet, due to their complex nature, neither Chi-squared nor the Mudambi's index has gained popularity in electoral studies.

3.2.4 Other indices

Lastly, there are indices that do not utilise either Δ or A concept in their construction. We do not assign these indices to a separate family due to their structural heterogeneity.

The Galeotti index (1994) measures the ratio between the logarithmic difference of the votes of the first two parties and the logarithmic difference of their seats:

$$\alpha = \frac{\ln \frac{s_1}{s_2}}{\ln \frac{v_1}{v_2}} = \frac{\ln s_1 - \ln s_2}{\ln v_1 - \ln v_2} \quad (3.25)$$

Apart from the lack of inclusivity, common to two-party indices, this index lacks a value when the first two parties receive equal votes, and it also has an unlimited range, making it difficult to compare various electoral systems.

Based on the notion of effective number of parties, an index is proposed by Taagepera and Shugart (1989) as:

$$T\&S = 1 - \frac{N_s}{N_v} \quad (3.26)$$

where N_v is the effective number of all parties in the election calculated using their vote shares according to formula 3.11 and N_s is the effective number of parliamentary parties calculated from their seat shares. N_s was proposed by Laakso and Taagepera (1979) and is defined as:

$$N_s = \frac{1}{\sum_{i=1}^{parties} s_i^2} \quad (3.27)$$

where s_i is the seat share of party i for any party that is represented in the legislature.

The T&S index can take positive as well as negative values depending on whether the electoral system has allocative bias in favour of larger parties or smaller parties.

The index assumes that as the disproportionality of an election outcome rises, N_s becomes smaller than N_v and the index starts to increase from 0 towards 1. However, it is uncertain whether malapportionment would result in change in N_s because sometimes the composition of seat shares and vote shares may look identical but the seats might have gone to the wrong

parties. The $T\&S$ index cannot capture malapportionment in such circumstances and shows full proportionality.

Further, there is no criterion in such formulation for ranking the disproportionality of electoral results. That is, unlike the Rae family of indices based on Δ , there is no clear way to attribute meaning to the difference in disproportionality of two election results because it does not take into account the fact that two apportionments with dissimilar voting outcomes but similar seat allocations can obtain similar values for N_v and N_s . For example, if all seats go to the winning party, index would be the same as when the whole seats are allocated to the least popular party. Table 3.1 illustrates this for a parliament with 140 seats.

Table 3.1

Result of the T&S index under different malapportionment scenarios

Party	Vote	Vote share	Seats under full proportionality	Scenario 1	Scenario 2	Scenario 3
		v_i	S_{iPR}	S_i	S_i	S_i
Party A	713,407	0.461	64	64	0	140
Party B	528,373	0.341	48	48	0	0
Party C	180,470	0.117	16	16	0	0
Party D	52,168	0.034	5	5	0	0
Party E	44,957	0.029	4	4	0	0
Party F	29,310	0.019	3	3	140	0
Total votes (V)	1,548,685					
Total seats (S)			140	140		
T&S				-0.007	0.655	0.655

Lastly, another directional index with a similar logic was proposed by Cox and Shugart (1991). This index uses the slope of the regression line between the votes and seats $s = av + b$ as the measure of disproportionality. In the absence of disproportionality, $a = 1$. More disproportionality adds to or deducts from a . This index may be calculated using the formula:

$$a = \frac{\sum_{i=1}^P ((s_i - \bar{s})(v_i - \bar{v}))}{\sum_{i=1}^P (v_i - \bar{v})^2} \quad (3.28)$$

where P is the number of parties, and $\bar{s}$ and $\bar{v}$ are the average seat shares and vote shares of all parties respectively. This index has two issues. First, it has an infinite range ($-\infty < a < \infty$). Second, the variation of the index in such a wide range does not have to be linear. It spikes to extremes of $\pm\infty$ when v_i or s_i are distributed evenly and perfect proportionality holds, or generally as the distribution of votes between parties approaches uniformity.

Based on the discussion above, three major problems with disproportionality indices can be discerned:

Incomprehensiveness: this problem arises when an underestimation or total elimination of disproportionality of some parties is theoretically justified. An example is when parties that fail to pass the electoral threshold are not considered in the calculation of index. Consequently, indices with this problem are sensitive only to malapportionment in certain segments of the vote-seat distribution and this can result in an underestimation or overestimation of disproportionality. This issue applies to I_{Rae} , PWI , L , I' , $Max A_i$, L_∞ , *Entropy*, and α .

Limited domain or infinite range: Some indices do not include a value for certain seat allocations. The indices that are limited in domain are called *surjective* in the jargon of mathematics. The Galeotti and Cox & Shugart indices are two examples. The former index has no defined value when the second party receives no seat or both parties receive equal votes and seats. The latter is undefined when all parties receive equal votes.

Some indices can approach infinity in range. These indices may become over-responsive around such points; i.e. their value may vary to a great extent with small changes in the input arguments. This is true especially when v_i or s_i are used in the denominator of the index formula and they approach zero. This problem pertains to indices α and a , while $Max A_i, L_\infty, L_1, L_2, Entropy$, and χ^2 suffer from it only in special circumstances.

Unit insensitivity: This occurs when there is no link between v_i and s_i of each party, and only aggregate quantities are used in measurement. For example, in the T&S index, disproportional distribution may undermine the representation of certain parties and boost that of others, but the effective number of parties in parliament remains the same as if the seats were distributed proportionately. Indices I_{Rae}, Gr, α , and $T\&S$ exhibit this problem in their mathematical construct.

Table 3.2 summarises the indices of disproportionality proposed in the literature, and their characteristics.

Table 3.2

Indices of disproportionality and their characteristics

Family	Index	Possible Range	Major problems		
			incomprehensiveness	Limited domain or infinite range	Unit insensitivity
Indices based on Δ	$D = \frac{\sum_{i=1}^P \Delta_i}{2}$	$0 < D < 1$			
	$I_{Rae} = \frac{\sum_{i=1}^P \Delta_i}{P}$ if $v_i \geq .005$	$0 < I < \frac{2}{P}$	✗		✗
	$Gr = \frac{\sum_{i=1}^P \Delta_i}{N_p}$	$0 < I < 2$			✗
	$PWI = \sum_{i=1}^P v_i \times \Delta_i$	$0 < PWI < 1$	✗		
	$L = \max \Delta_i$	$0 < L < 1$	✗		
	$I' = \frac{\sum_{i=1}^2 \Delta_i}{2}$	$0 < I' < 1$	✗		
	$Gh = \sqrt{\frac{\sum_{i=1}^P \Delta_i^2}{2}}$	$0 < Gh < \frac{1}{\sqrt{2}}$			
	$D_p = \sqrt{\frac{2 N_p}{N_p + 1}} \times Gh$	$0 < D_p < 1$			
Indices based on A (or A^0)	D'Hondt Index = $\text{Max } A_i$	$0 < \text{Max } A_i < \infty$	✗	✗ ¹	
	$L_\infty = \frac{S}{V} \times \max A_i^0 $	$0 < L_\infty < \infty$	✗	✗ ¹	
	$L_1 = \frac{S}{V} \times \sum_{i=1}^P A_i^0 $	$0 < L_1 < \infty$		✗ ¹	
	$L_2 = \left(\frac{S}{V}\right)^2 \times \sum_{i=1}^P A_i^{0^2}$	$0 < L_2 < \infty$		✗ ¹	
	$Entropy = \sum_{i=1}^P (s_i \times \ln A_i)$	$0 < Entropy < \infty$	✗	✗ ¹	
	$G = 1 - \sum_{i=1}^P v_i \left[\sum_{j=1}^i 2s_j + s_i \right]$	$0 < G < 1$			
Indices based on Δ and $(A$ or $A^0)$	$\chi^2 = \sum_{i=1}^P (A_i^0 \times \Delta_i)$	$0 < \chi^2 < \infty$		✗ ¹	
	$1 - p \left[t < \sum_{i=1}^{P-1} (A_i^0 \times \Delta_i) \right]$	$0 < \chi^2 \text{ probability} < 1$			
Other Indices	$\alpha = \frac{\ln s_1 - \ln s_2}{\ln v_1 - \ln v_2}$	$-\infty < \alpha < \infty$	✗	✗	✗
	$T\&S = 1 - \frac{N_s}{N_p}$	$0 < T\&S < 1$			✗
	$a = \frac{\sum_{i=1}^P ((s_i - \bar{s})(v_i - \bar{v}))}{\sum_{i=1}^P (v_i - \bar{v})^2}$	$-\infty < a < \infty$		✗	

¹ In reality infinity may occur when at least one member of the parliament is appointed (i.e. elected by zero votes)

² P is the number of parties running in the election

3.3 A theoretical framework for introducing an alternative index for the measurement of electoral disproportionality

Based on the review of the existing indices and their shortcomings discussed in the previous section, we believe that D , D_p and G are the best indices among those that are free from major theoretical and/or methodological problems. The Gallagher index is the non-normalised equivalent of D_p . However, although it does not have the problems inherent in other indices, it has no advantage over D_p .

When implemented, all three indices yield very similar results. However, they differ in the meaning that may be attributed to them. D is very straightforward and expresses the portion of seats that are not distributed to the correct party compared to a proportional allocation. Both D and D_p are constructed using the concept of Δ and adopt it in a similar manner. Nonetheless, D_p is more difficult to interpret theoretically, especially since N_v is inserted in the formula only to allow for normalisation of the index to the [0–1] range. Therefore, we believe that D_p is subsumed into D in terms of what it can contribute to the measurement of disproportionality.

3.3.1 D or Gini?

The Gini index (G) is D 's main competitor. However, there is a good case for preferring D over G in the context of electoral studies. An example may illustrate this assertion more clearly. Assume that there are 10 parties in an election each winning 10% of the votes. Three electoral systems devise the seats based on these results in three different ways according to the figures in table 3.3. Similarly, we can think of these scenarios as three distributions of income between population deciles.

Table 3.3

Three different electoral scenarios with different G index but same D index

Party/Income Group	% Votes (or population)	% Seats (or Income)		
		Scenario 1	Scenario 2	Scenario 3
A	10	5	9	9
B	10	10	9	9
C	10	10	9	9
D	10	10	9	9
E	10	10	9	9
F	10	10	10	11
G	10	10	10	11
H	10	10	10	11
I	10	10	10	11
J	10	15	15	11
	Gini	9.0	7.0	5.0
	D	5.0	5.0	5.0

In each scenario, 5% of the seats are malapportioned. In the first scenario, all malapportioned seats are taken from the top party and transferred to the bottom party. In the second scenario, malapportioned seats are taken equally from the first five parties and assigned to the bottom party; and in the third scenario, malapportioned seats are taken equally from the top five parties and distributed evenly among the bottom five parties. As shown in table 3.3, D is 5% and

constant across all scenarios, ideally representing the very 5% of the seats that are malapportioned. Conversely, the G value increases from right to left the more the malapportionment is concentrated at the bottom and top ends of the distribution.

The use of the Gini index to measure income inequality makes sense because different income groups can be rank-ordered in terms of their access to economic means; hence, the measure should be normatively more sensitive to the deprivation of the poorest segments of society than that of the middle income groups.

Conversely, in the context of electoral studies, parties may not be rank-ordered based on their importance to the political system. Any party that receives fewer seats than it ideally could have won under proportional distribution would lose the opportunity of fully representing a certain segment of the society in political bargaining and decision making (especially the possibility of joining a ruling coalition). As far as democratic representation is concerned, this misallocation is malignant irrespective of the degree of electoral popularity of the parties that are subject to vote-seat malapportionment.

When distortion from this ideal of proportionality is allowed or promoted by an electoral system, and the quality of representativeness is compromised, it can be justified only if it serves some equally important political goal such as national cohesion (for example by over-representing certain social minorities) (Bjarnegård & Zetterberg 2014). Without doubt, such decisions come at a cost: the erosion of the egalitarian spirit of a representative democracy.

As the figures in our example suggest, the Gini index ranks three equally defective cases of apportionment differently on the grounds of their different concentration profiles of malapportionment, whereas D is insensitive to which party would lose and gain in a disproportional distribution. Therefore, Gini is less informative compared to D in the context of electoral studies.

3.4 Constructing a modified index based on D

In this section, we offer four modifications to the D index to improve its precision and address several theoretical problems associated with it. As noted previously, D has several advantages in measuring disproportionality compared to other indices. It is simple to calculate and has a tangible interpretation. It is inclusive of all vote-seat malapportionments between all parties and is not complicated by dimensions other than malapportionment, such as the effective number of parliamentary parties. However, D is defined in such a way that it can never take the value of zero even when seats are allocated proportionally. The reason is that parties' vote shares $\{v_i\}$ and seat shares $\{s_i\}$ are normalised against different maximums (total votes (V) and total seats (S)) and are often not equal (Karpov 2008, 1422). A v_i percentage of the votes cannot always be translated into an equal s_i percentage of the seats because v_i can take many more values within the range 0%-100% but s_i can take only certain values within that range. For example, if the size of the legislature is 250, and 1,274,734 votes have been cast, then $s_i = \frac{S_i}{\text{Legislature size}}$ can take only those values made from the string $\{\frac{1}{250}, \frac{2}{250}, \dots, \frac{250}{250}\}$ while $v_i = \frac{V_i}{\text{total vote}}$ takes values made from the string $\{\frac{1}{1,274,734}, \frac{2}{1,274,734}, \dots, \frac{1,274,734}{1,274,734}\}$. Evidently, many of the values in the s_i set have no counterpart in the v_i set (formula 3.29).

$$\begin{bmatrix} v_1 \\ v_2 \\ \vdots \\ v_n \end{bmatrix} \neq \begin{bmatrix} s_1 \\ s_2 \\ \vdots \\ s_n \end{bmatrix} \quad (3.29)$$

Hence, the translation of the large numbers of votes to a small number of seats is always inherently disproportional independent of the apportionment mechanism employed by an electoral system.

The D index that is defined as:

$$D = \frac{\sum_{i=1}^{parties} |v_i - s_i|}{2} \quad (3.30)$$

cannot handle this problem. Therefore, the first proposal of this study for the modification of D is to compare the actual distribution of the seats with the best possible proportional allocation to the same legislature. This brings us to the following interim formula:

$$D' = \frac{\sum_{i=1}^{parties} |s_{iPR} - s_i|}{2} \quad (3.31)$$

Here, s_{iPR} is the portion of seats that each party gains when votes are allocated to the same parliament but with the most proportional method in the absence of any disproportionality-producing elements such as quota, electoral threshold, districting and other incentives for strategic voting.

The second proposed modification is in regard to the effect of the size of the legislature on disproportionality. Smaller legislatures make it less likely for the electoral system to be able to allocate proportionately the fractions of vote shares to seats (which are whole numbers). Table 3.4 illustrates this point with an example. As is shown, when a certain electoral outcome is apportioned to a legislature with 100 seats, the D index shows 0.857% disproportionality. When the same results are allocated to a legislature of 359 seats, disproportionality drops significantly to a mere 0.001%.

Table 3.4

The effect of the legislature size on the possibility of proportional seat allocation

Party	Vote	% vote	legislature size =359		legislature size =100	
			seats	% seats	seats	% seats
A	15,927,807	55.85%	201	55.8	56	56
B	8,021,531	28.13%	101	28.1	28	28
C	2,711,972	9.51%	34	9.5	10	10
D	803,432	2.82%	10	2.8	3	3
E	561,161	1.97%	7	2.0	2	2
F	397,147	1.39%	5	1.4	1	1
G	96,550	0.34%	1	0.3	0	0
Total	28,519,600	100%	359		100	

D

0.001%

0.857%

While the size of the legislature is an important aspect of the electoral system to be factored into the calculation of disproportionality, the question is: against which reference point (of legislature size) should this comparison be made? Can there be a 'right' size for the parliament

and, if so, how can we know that? This question will be answered in section 4.3.1 of the next chapter. However, for the moment, let us just assume that an ideal size exists for every individual country. To distinguish between an actual and an ideal-sized legislature, we call them S and OSL_A respectively, where OSL stands for the *optimal size of the legislature* and OSL_A is the formula that this research introduces for the calculation of the optimal size of the legislature (See section 4.3.1 for the definition of OSL_A). Hence, the second interim formula for the modification of the D index would be:

$$D'' = \frac{\sum_{i=1}^{parties} |s_i(OSL_A) - s_i|}{2} \quad (3.32)$$

The third proposed modification deals with the capacity of the electoral formula to allocate the seats proportionally. The Largest Remainder or Hare-Niemeyer method (hereafter LR or LRM)⁴⁹ is the most proportional method of seat allocation ever proposed (Kestelman 2005, 13). However, even the LR method often does not result in a purely proportional distribution when the expected outcome is an allocation of seats in a legislature of finite size (an integer number).

In summarizing the three points made above, we define a proportional allocation as follows:

A proportional allocation is one that allocates seats with the most proportional method in hand to an ideal-sized legislature.

The definition given above acknowledges that practical limits (allocation from large numbers (votes) to small numbers (seats)), the ideal size of the legislature, and the ideal apportionment mechanism should not be endogenised to the calculation of disproportionality because they are beyond control in all electoral systems. Therefore, as a third modification, we operationalise the above definition of disproportionality with the following formula and call it D''' :

$$D''' = \frac{\sum_{i=1}^{parties} |s_i(OSL_{A,PR}) - s_i|}{2} \quad (3.33)$$

In this formula, $s_i(OSL_{A,PR})$ is the portion of seats that party i could have won under the highest achievable proportionality (i.e., using an LR allocation with no disproportionality-producing element in the electoral system) in an ideal-sized legislature (of the size OSL_A), and s_i is the portion of seats the party wins in an election.

The last improvement over D is technical (not theoretical). To calculate D , vote shares and seat shares of the parties have to be converted into percentages first to become comparable.⁵⁰ Mathematically, conversion to fractions often reduces the precision of the measurement⁵¹ and calculation of D involves two counts of such conversions. When we replace v_i in formula 3.30 with $s_i(OSL_{A,PR})$ in 3.33, everything in the formula is expressed in the same unit (seat shares) but

⁴⁹ This method was originally proposed by Thomas Hare between 1857 and 1865 (the exact data not known to the author) and later reformulated by Niemeyer in 1984. See chapter 5 for explanation of the method.

⁵⁰ $\left\{ \begin{matrix} V_i \rightarrow v_i \\ S_i \rightarrow s_i \end{matrix} \right\} \rightarrow D = \frac{\sum |v_i - s_i|}{2}$

⁵¹ For example, when a party share of 27 out of 103 seats is expressed in the form of a fraction, it is $\frac{27}{103}$. But when it is converted to a percentage, the result is an irrational number ($=0.262135922330097...$) with infinite decimals. Rounding such a number to, say, a double-digit decimal (i.e. 0.26) would reduce the precision of the expression.

similar to the calculation of the D index, we still have two counts of conversion from whole numbers (seats) into real numbers (percentages). The imposed imprecision can be reduced by replacing $S_{i(OSL_A, PR)}$ with $S_{i(OSL_A, PR)}$ which is the number of seats that party i can gain in an ideal-sized parliament with the best allocation method. However, if instead of percentages we use the actual number of seats that parties gain, there is still one problem: $S_{i(OSL_A, PR)}$ and S_i are still incomparable because they represent different legislature sizes ($\sum S_i \neq \sum S_{i(OSL_A, PR)}$). To tackle this problem, the actual party seat numbers (S_i) can be projected to an ideal-sized legislature using the LR electoral formula and be called $S_{i(OSL_A)}$. Now the two entities are comparable without requiring conversion from whole numbers to fractions. This fourth modification brings us to the final formula for the modified index of disproportionality which we call D_a . D_a is calculated with:

$$D_a = \begin{cases} \frac{\sum_i |S_{i(OSL_A, PR)} - S_{i(OSL_A)}|}{2 OSL_A}, & S < OSL_A \\ \frac{\sum_i |S_{i(PR)} - S_i|}{2 S}, & S \geq OSL_A \end{cases} \quad (3.34)$$

The procedure for the calculation of D_a is as follows:

- Step 1: party votes (V_i vector) is apportioned to an ideal-sized legislature using the LR formula: $V_i \rightarrow S_{i(OSL_A, PR)}$
- Step 2: seats gained in the actual legislature are projected to an ideal-sized legislature using the LR formula: $S_i \rightarrow S_{i(OSL_A)}$
- Step 3: D_a is calculated using the index formula (formula 3.34)

If the actual size of a parliament (S) is greater than its predicted ideal size ($S > OSL_A$), then OSL_A will be replaced by S in step 1 of the calculation procedure, and step 2 is omitted. With these modifications to D , when $S \geq OSL_A$ and the allocation formula is LR, a zero value for perfect proportionality is achievable as a reference point, allowing comparison between countries. In other words, using the D index disproportionality of zero can be achieved only when the size of the legislature is infinite or equal to the size of the voters, and a purely proportional hypothetical allocation method is applied. On the other hand, D_a compares an actual distribution of the seats to a distribution to an ideal-sized legislature with the best existing electoral formula (LR). That is to say, D 's reference point is an unachievable ideal of proportionality, whereas D_a 's is the most realistically achievable proportionality.

We conclude this section by presenting the level of systemic disproportionality measured by each of the three indices, D , D' and D_a , for a hypothetical electoral system where $OSL_A = 124$. Figure 3.5 shows the results of the measurement using the simulation approach for the electoral system of Namibia as a simple example (see section 5.5.1 for elaboration). Systemic disproportionality is measured for various sizes of legislature from 24 to 124 and for two-seat allocation methods: Largest Remainder Method (LRM) and Highest Average Method (HAM).⁵²

⁵² Namibian electoral system uses RLM.

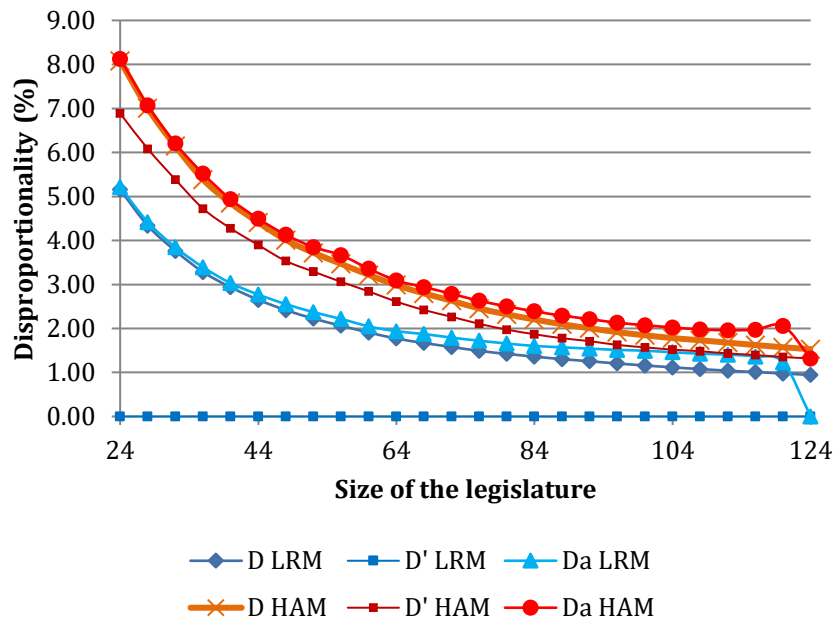


Figure 3.5

Electoral disproportionality measured by three indices D , D' and D_a for a simple electoral system as a function of the parliament size

The graph shows that the D index never takes a value of zero because it compares the actual seat allocation to an unachievable proportional distribution. As expected, using D' results in a more realistic and deflated measurement under both LRM and HAM scenarios for all parliament sizes. Finally, D_a inflates measurement compared to D' because it assumes that the lower-than-ideal size for parliament is normatively undesirable and will exacerbate disproportionality. Consistent with the theory, both D' (LRM) and D_a (LRM) can take a value of zero, but D_a approaches zero only at (and above) OSL_A , while D' is insensitive to the size of the legislature and is zero for the LRM method for all parliament sizes.

3.5 Summary

This chapter reviewed several indices of disproportionality proposed in the literature, and discussed their pros and cons. This review resulted in a number of theoretical and practical modifications to be made to the common index D in order to propose a new index (D_a). It was explained at length that, unlike other indices, this index has a reference value of 0 that is that is achievable in practice. D_a 's value is zero when the size of the legislature is equal to or above an optimum size, no districting or quota or electoral threshold are imposed, and the vote count mechanism is LRM. The next chapter will introduce a methodology for measuring the systemic disproportionality of electoral systems using the proposed index D_a .

Chapter 4

Introducing a simulation methodology for the measurement of systemic disproportionality in electoral systems

4.1 Introduction

This chapter focuses on the techniques to measure disproportionality indices. Since its inception, literature on the question of electoral disproportionality has been dominated by the empirical application of measurement methods to actual election data to report the level of disproportionality of an electoral system. However, this fails to endogenize the effect of voters' behavioural adaptations on the election outcome data. This chapter addresses this problem by offering an alternative measurement methodology based on the computer simulation of electoral systems and voting outcomes. This technique eliminates the effect of behavioural factors on measurement. At the same time, it allows for the decomposition of the disproportionality along multiple components of the electoral system.

Two problems are associated with the empirical approach. First, every voting outcome is translated differently to a seat allocation, hence the same system yields different levels of disproportionality for different elections. To tackle this problem, the disproportionality level of every country's electoral system has been reported in the literature as a time average over repeated measurements for different election years (see for example Lijphart 1990; Gallagher 1991; Gallagher and Mitchel 2005; Iveresen and Soskice 2006; Karpov 2008; Kalandrakis 2008).

This workaround is limited by the fact that in many democracies electoral rules have been reformed multiple times. Instances of a major electoral overhaul in established democracies are rather uncommon (Norris 1997, 1; Katz 2005, 59). At the same time, in many countries, moderate electoral reforms happen every few years or decades. This means to avoid comparing apples and pears; the reported disproportionality averages must be constructed from only a handful of data points, which is no guaranty for proper control of the temporal fluctuations.

Secondly, and a more critical problem with the empirical approach, is its failure to account for the behavioural effects of the electoral systems on voters' choice and the parties' campaign strategies. In response to expectations about how the vote-seat translation is going to take place, voters and parties adjust their approach to the election. When votes in certain constituencies are more valuable to the outcome than in others, parties focus their campaigning investment on those certain areas. Simultaneously, when voters know, for example, that an electoral system is forbidding to smaller parties, they opt not to vote for these parties because voters see no prospect of success for such small parties. This pushes the voters to exercise

strategic voting. Strategic voting partially disguises the disproportionality of the electoral system because now only votes likely to affect the election outcome are cast.⁵³ In other words, the empirical measurement of disproportionality tends to exogenise voters' behavioural adjustments.

Very recently this problem has captured the attention of a few scholars (Lachat, Blais and Lago 2012, Best and Zhirnov 2015, Laslier et al. 2015). Figure 4.1 is the illustration of the point taken from Best and Zhirnov (2015). As a workaround, they recommend "replacing measures of observed disproportionality with more direct measures of electoral system characteristics such as district magnitude" to produce more reliable measurements (p. 256).

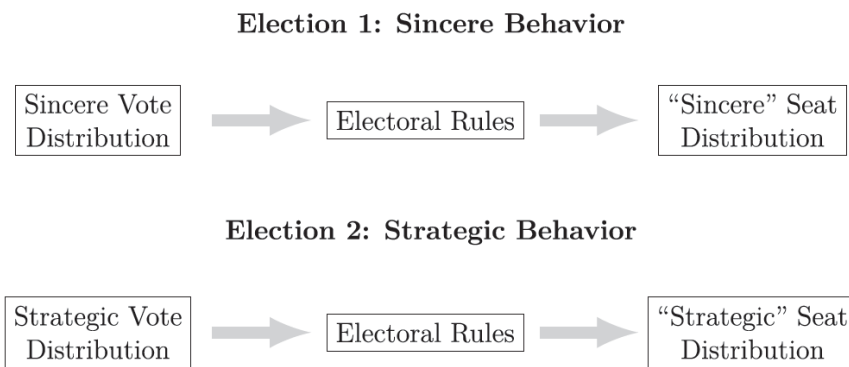


Figure 4.1

Illustration of the behavioural adjustment effect as shown in Best and Zhirnov 2015

Source: Best, Robin E., and Andrei Zhirnov (2015, 258). "The Perils and Pitfalls of Ignoring Disproportionality's Behavioral Components."

Recently, attempts have been made to measure disproportionality using what we call *the simulation approach*. This approach involves feeding an electoral system with hundreds or thousands of hypothetical voting outcomes, calculating the resulting disproportionality over each iteration ($d_{simulation}$) and estimating the overall disproportionality by averaging over all these results. So if the number of iterations is denoted as n , then:

$$disproportionality \sim \frac{\sum_{i=1}^n d_{simulation}}{n} \quad (4.1)$$

Karpov (2008) created a 10,000-unit sample of voting outcomes and seat distribution pairs to feed into every index of disproportionality and compared their outcomes. Linusson and Ryd (2013) created a 10,000-unit sample of voting outcomes around the actual outcome of the 2010 Swedish General Election, using a 10% variation in the vote of every party to measure various

⁵³ For example, Iversen and Soskice (2006, 172-3) report a normalized equivalent of the Gallagher index for 17 countries (Table 5.16) using the empirical method. An index value of zero represents full disproportionality. In their dataset, figures for Canada, UK, New Zealand (until 1996) and Australia vary significantly despite all having very similar electoral system designs. While the index value for Canada, UK and Australia are 0.13, 0.16 and 0.19 respectively, in the US case they report 0.39 only because in the US there is no significant concentration of vote for minor parties while the system in use is virtually identical to the UK and Canada. Similarly, New Zealand receives a value of 0 because of a period of crisis of electoral system in the 80s and 90s in which sizable voters turned their back to the two major parties and voted for their minor competitors (Griffith-Traversy 2002, 142). Had disproportionality been measured for New Zealand prior to the 80s results could have probably been equal to the level reported for the US while there was no difference in the design of the electoral system.

characteristics of a few alternative electoral systems including their resulting disproportionality. McGann et al. (2016) took a similar approach to the study of gerrymandering in the US electoral system. Magar et al. (2017) took a somewhat different approach by using Monte Carlo simulation to multiply national voting and seat allocation outcomes from a pool of district outcomes drawn from the results of real elections.

Also, as far as we are concerned, there are currently two pieces of software available to researchers to create random samples of voting outcomes to be used in the simulation modelling of electoral systems. One is called *Dispr* (<https://pierzgal.github.io/dispr/>) which is purposefully designed for the estimation of disproportionality. *Dispr* allows for the use of different apportionment methods and disproportionality indices, but offers a limited possibility to simulate complete electoral systems and manipulate their other elements such as thresholds or district magnitudes. The second software is called *Alex3* (Bissey, Carini and Ortona 2003). This program incorporates wider elements of the electoral system in laboratory settings. Likewise, this does not offer complete modelling of implemented country electoral systems.

The simulation approach is advantageous because it can address both problems chronic to the empirical approach. With simulation, the disproportionality of an electoral system which is of a systemic character (regardless of how people vote in practice) can be inferred by averaging its practical value over a large number of probable electoral outcome samples. When a disproportionality index is calculated over such a vast pool of probable outcomes, problems mentioned above may not happen.

The second problem of the empirical approach is eliminated in simulation thanks to the composition of the input sample. If done properly, simulation must produce random voting outcomes with a uniform distribution within the behavioural boundaries found in the countries with the most proportional electoral rules. That is to say, even in simulation, sample units should not take mathematically possible values that are very unlikely to happen in reality. But instead of representing voters' behavioural adjustment as a result of the electoral system in question, the sample represents the actual voting behaviour of voters under systems with fewest incentives for tactical voting in their design.⁵⁴

In the following sections, first the components of an electoral systems that contribute to electoral disproportionality (and factors related to the context of their application) are discussed (section 4.2). In sections 4.3, an alternative approach to the measurement of disproportionality is introduced based on computer simulation. We propose a measurement methodology for the operationalisation of this approach. The assumptions and constraints under which we run our simulations will be thoroughly described as the methodology for simulation is expounded in section 4.3. Lastly, section 4.4 introduces the input data that is generated in this research to be used with our measurement method.

⁵⁴ Some researchers argue that behavioural adjustments and strategic voting are not absent from proportional systems either. They maintain that even under proportionality voters still are inclined to make strategic decisions to vote for parties that they favour less (see for example Abramson et al. 2010). While this is true, we consider strategic voting under PR to be driven by motivations beyond the design of the electoral system because a PR system places minimal restrictions on the possibilities for political representation. So, if voters vote for parties that are more likely to be in the governing coalition as opposed to their favourable party and they do this to avoid another coalition from being formed this does not stem from the restrictions of the electoral system. Rather, it may reflect the salience of social cleavages and political conflicts.

4.2 Determinants of electoral disproportionality

A variety of factors, internal or external to the electoral system design, may affect its disproportionality. These factors may be classified into four categories: structural, structural-contextual, contextual and behavioural-contextual. This section identifies 17 factors affecting electoral proportionality and briefly explains each. Five of the factors are controlled for in the design of our modelling framework. This section will explain the assumptions made in the model regarding these five factors. Of the remaining 12 factors, seven are included within the model. In section 4.3, how these factors are operationalised will be explained in detail. A list of these factors is presented at the end of this section in table 4.1.

4.2.1 Structural factors

Structural factors are those aspects of the electoral system that directly affect proportionality. Top of the list is the electoral formula.

4.2.1.1 Electoral Formula: This umbrella term may cover a variety of rules for deciding the election results, but here we use it in the strict sense of the central criteria for counting the votes and allocating seats to parties. In this sense, those other criteria such as thresholds and districting may be considered as amendments to this core vote counting formula and are dealt with separately.

Electoral formulas include (but are not limited to) the following:

- **Proportional:** Largest remainder method (a.k.a. Hare-Niemeyer), single transferable vote, mixed method proportional
- **Semi-proportional:** D'Hondt, Sainte-Laguë, modified Sainte-Laguë, Imperiali, Huntington-Hill, Danish method and other members of the Highest Average family of the methods
- **Majoritarian:** First-past-the-post, alternative vote (a.k.a. instant runoff), cumulative voting, single non-transferable vote, bloc voting or plurality-at-large, Coombs' method, supplementary voting, Bucklin voting, and Condorcet method.

The mechanics of some of the most common electoral formulas used for election to the national legislatures are explained at length in chapter 5 and appendix C.

4.2.1.2 District Magnitude: Closely linked to the electoral formula is the magnitude of the electoral districts. In most cases, the electorate is divided into sub-national electoral districts of different magnitudes (except in the Netherlands and a handful of other countries). District magnitude is measured by the number of seats available in that district for contest in an election. Usually, but not always, these districts correspond to the administrative subdivisions of a country at the provincial level and may vary in size between one and tens of seats. As elaborated in Lijphart and Aitkin (1994, 10), if not corrected for at the national level, this act of sub-dividing into electoral districts will become the single most impactful factor in deviating the election outcomes from proportionality, aside from the electoral formula. This distortion would be more significant the smaller the average district magnitude is and the greater the frequency of smaller districts.

4.2.1.3 Threshold of representation: Natural threshold for the representation of parties (Th_n) is set by the size of the legislature (S) and is equal to:

$$Th_n = \frac{100}{s} \quad (4.2)$$

Natural threshold is not a real threshold to be exceeded for a party to be represented. Some electoral formulas such as the largest remainder method, allow for lower vote gains. For example, one that is equal to 0.85 of a seat, to be translated into a whole seat for a party.

On top of the natural threshold, many countries set arbitrary legal thresholds to limit the number of parliamentary parties and curb the level of fragmentation in the parliament to prevent the formation of fragile government coalitions. While natural threshold is a soft threshold, legal thresholds are rigid hurdles and must be clearly exceeded before a party can qualify for seat allocation. In practice, this threshold is seen to vary between zero and as high as 10% (Rodriguez et al. 2013, 102). There is a wide variation in the electoral threshold design among countries. For example, this figure is 10% in Turkey, but since there is no limit for the representation of independents in the Turkish electoral law, this very high threshold is being circumvented by smaller parties when they run some of their candidates as independents. Therefore, in reality, the effective threshold of representation is slightly lower in Turkey. In New Zealand and Germany, where two types of vote are cast by the voters, passing the electoral threshold is waived for parties that win at least one electorate seat, rendering it difficult to model the electoral system regarding its effective electoral threshold. Other countries such as Sweden have a district level threshold that is substantially higher than the national threshold. Finally, some countries such as Norway and Denmark apply the threshold only to certain stages of the seat allocation procedure.

4.2.1.4 Quotas: Quotas are designed to accommodate representation of certain populations that are either socially or numerically underrepresented. Gender quota for women is a recent trend that exemplifies the social quota system. More traditionally, religious or ethnic minorities have been given quotas of representation irrespective of their relative population size. The same applies to people in remote geographical areas or autonomous regions of a country (e.g. Greenland and Faroe Islands in Denmark's Folketing). Another interesting example is Finland, where quotas for rural areas manifest themselves in the form of district magnitudes, larger than the national average.

Gender quotas require parties to allocate a certain portion of their lists to women. Because gender quotas are concerned with candidates and not the voters, they are not a source of disproportionality in the electoral system. They can only be used with closed-list systems. Three prominent examples are Tanzania, Pakistan and Bangladesh. All other forms of quota are likely to cause disproportionality as they favour some subgroups of the electorate over others in terms of representation.

4.2.1.5 Levelling mechanism: Levelling mechanism is an arrangement to adjust the final composition of the legislature in line with the principle of proportionality in multi-district electoral systems where seat allocation initially takes place at the district level. In the absence of levelling in such systems, no amount of proportionality at the local level can guaranty overall proportionality of the electoral system. This is due to the very high natural threshold of representation at the district level. For example, in a country divided into 10 districts each with 10 seats the natural threshold of representation is $100/10=10\%$ while at the national level this threshold can be $100/100=1\%$. This means that in the absence of levelling, a party may win 9.9% of the vote in all districts without being represented in the parliament. Several of the Latin

American electoral systems (Suriname, Costa Rica, Peru, Paraguay, Uruguay, and Chile) are examples of local proportionality without national levelling.

The five structural parameters enumerated above are incorporated into the simulation method of this research. Five other structural factors that are of a different nature and are not accounted for in our calculations. These are listed below.

4.2.1.6 Number of election rounds: In rare instances, two-round or runoff system is used for parliamentary elections. The two best-known examples of this are Mali and France. In two-round systems, candidates are elected from single-member districts. If no candidate in a district can pass a threshold of majority or plurality (e.g. 50% of the vote) then the two most popular candidates will compete at the second round to decide the fate of the district seat. Because this system reveals partial information about the potential result during the process of election (after the first round), it opens the door to a lot of inter-party exchange of favours and pact-making, which in turn leads to widespread strategic voting on the side of their supporters (Grossman and Sauger 2013, 111). The quality of these pacts and exchanges is largely reflective of the political landscape of the country at the time of the election and the amount of support parties believe they can garner from the voters. As a result, deciding the outcome of the second round in a mathematical simulation is impossible, meaning one can only rely on the actual election results to calculate disproportionality of such systems.

4.2.1.7 Bicameralism: Bicameral legislatures exhibit cases of conflict of representation. They normally entail different methods of seat allocation and hence produce chambers with different compositions (Przeworski 2010, 139-140). In recent times, power of the second chamber has been curbed in many countries and it plays a marginal role in legislation (Coakley 2014). However, in cases of strong bicameralism, deciding which chamber is representing the will of the electorate is not easy. This challenge is also faced by the empirical approach to the measurement of disproportionality. Traditionally, researchers reporting on the disproportionality of legislatures, have been concerned solely with the lower house of the parliament. However, this is a haphazard choice not backed by theoretical argumentation. We believe reporting disproportionality on bicameral parliaments by looking only at the lower chamber is arbitrary and misleading and should be avoided. In our database of political democracies, Australia, Argentina, Bhutan, Bolivia, Bosnia and Herzegovina, Brazil, Chile, Colombia, Dominican Republic, Germany, Italy, Kenya, Liberia, Mexico, Nigeria, Pakistan, Philippines, Romania, Switzerland and the United States are current examples of strong bicameralism. Of these countries, those that have similar electoral systems at both chambers are included in our simulation. Those with proportional or semi-proportional electoral rules for one chamber and majoritarian rules for the other are excluded because a difference in the electoral rules can produce very different and conflicting outcomes in opposing chambers.

4.2.1.8 Ballot structure: Design of the ballot can be simple and understandable or complex and confusing. This is known to have an impact on the validity of the vote cast. Certain subgroups of the population with lower educational or cognitive abilities are more likely to fail to cast a valid vote (Herrnson et al. 2012). Should the preference of these subpopulations be for certain parties, the ballot structure can erode the constituency for those parties (such as those advocating the rights of the elderly, disabled, or very poor segments of the society) and discriminate against them in terms of parliamentary representation.

4.2.1.9 Voting age/voting eligible population ratio: Electoral systems may disqualify certain subsets of the electorate from voting. In every country, only a portion of the voting age population (VAP) are eligible to cast their vote. This subset is called the voting eligible population (VEP) and is exclusive of people like non-citizens, people with a felony conviction, mentally incapacitated persons, prisoners, homeless citizens or those living abroad. Countries vary widely in the discrepancy between the VAP and VEP figures, and it can be another factor to differentiate electoral systems in terms of their proportionality.

A common cause of the discrepancy between VAP and VEP is the voter registration mechanism. In some countries, voter registration is automatic. In others, it is cumbersome and happens several months before the election. People who change their residence after the registration may not be entitled to vote in their new electoral district as a consequence (Taagepera & Shugart 1989, 17). As in the example of the ballot structure, the electoral system can be selective in denying certain demographic groups the right to vote, hence reducing their political representation relative to their population size (Griffith-Traversy 2002, 128). For example, electoral registration hurdles, especially in some of the southern states in the US, have been the subject of several studies (e.g. Cobb, Greiner and Quinn 2012, Smith 2015). By imposing certain rules on early registration deadline and stringent voter ID laws, these states limit the possibility of registration for those who cannot afford to pay for updated ID documents or who do not have access to the internet or physical voter registration centres weeks ahead of the election (Smith 2015).

4.2.1.10 Hurdles to party nomination: The last structural aspect of the electoral system are the rules concerning the ballot access. Ballot access restriction is generally justified as a measure to decrease the fragmentation of the parliament (Bennet 2009, 45). While thresholds can also be used for such purposes, nomination restrictions have a more anti-democratic and anti-proportional effect, as they deny the minor parties the chance of presenting themselves to the public even before failing to meet an electoral threshold. Bowler, Donovan and van Heerde's (2005) explain this phenomenon in the US electoral system in detail:

"Unlike other established democracies, the USA permits one set of standards of ballot access for established 'major' parties and a different set for all other parties. States have unfettered control over which parties are granted 'major party' status. ... In some states laws allow minor parties to reach major party status and thus secure positions on the ballot for all partisan contests. In other, such parties may qualify for ballot access in state elections, but separate qualification processes may be required for Congressional elections. ... it can take new parties and movements considerable effort simply to get their names on the ballot. In general, the process requires that a party obtain a required number of signatures from registered voters. Some states allow minor parties ballot access in future elections if one of their candidates receives a certain threshold of votes in a state-wide contest (e.g. 5 percent). Threshold numbers for the petition route, and the vote share route, vary by state and office. ... Ballot access laws have obvious consequences for the party system. Democrats and Republicans remain the only parties guaranteed general election listings for all partisan contests in all states. No 'third' party has listed candidates in a majority of US House races since 1920, and none has been elected to Congress in recent years." (Bowler, Donovan and van Heerde 2005, 188-194)

This is the pretext for the authors' assertion that, "measures of disproportionality understate the level of distortion in US elections since minor parties are often excluded from the ballot." (Bowler et al. 2005, 194)

Nomination hurdles undermine the social agendas of minor parties, in addition to concealing voter preferences by disallowing parties to run in elections. However, taking account of them in simulation-based studies of disproportionality is often very impractical, since rules governing the exclusion of parties from ballot vary largely across countries. Meaning it is difficult to determine whether small parties can register in an election before this is tried in practice. Even then, their participation in the election may be bound to certain districts where they enjoy higher popularity among the voters.

4.2.2 Structural-Contextual factors

4.2.2.1 Size of the legislature: This is the only variable we classify under the structural-contextual category. Because the size of the legislature reflects an equilibrium between the size of the population (as a contextual factor) and feasibility and other considerations as part of the political system design (a structural factor). In introducing D_a above, we discovered there is no such thing as pure proportionality in representative democracies. Inherently, representation is prone to disproportionality even if only for its projection of many votes into a much smaller number of seats. However, so long as the legislature size is large enough and agents of this political representation are parties instead of independent representatives, the resulting disproportionality could be random and reasonably small. This could only be the result of the distribution of a single seat more or less among the parties, based on the remainder vote in LR method, which is again random (Lijphart & Aitkin 1994, 12).

But when can it be said that a legislature is large enough? This question is hard to answer theoretically. It may be argued that the smaller the size of the voting eligible population per seat, or the smaller the percentage of the population being represented by each MP, the better (Sutherland 2015). In the context of national legislatures, looking at the evidence may give some clues. In the real world, legislature sizes vary between 30 in Barbados and 2987 in China; or if China does not sound to qualify as a democracy, Britain with 650 MPs in the House of Commons. On the other hand, while British parliament offers one seat for every 0.15 % of the eligible voters, Barbados lies on the other extreme, offering a seat only to every 3.33 % of the electorate. In terms of the number of eligible voters per seat, we see the Maldives sits on one end of the spectrum, assigning one seat per every 2,765 voters. While on the other end, neighbouring India has one seat for every 1,352,233 voters.

This diversity suggests there is hardly any consistent pattern of optimal legislature size among countries. Two practical considerations determine the legislature size. For the smaller countries, sustaining a large legislature is too costly. For large nations, it is a question of practicality to have legislatures with hundreds of delegates.⁵⁵ In sub-section 4.3.1 we outline our approach to defining an ideal parliament size. This ideal size serves as a reference point for each country to ascertain the amount of disproportionality introduced by its legislature being smaller than this ideal size.

⁵⁵ Literature also points to the impact of assembly size on the level of corruption in countries. See for example Chang and Golden (2007) and the level of public expenditure: Thomas W. Gilligan, and John G. Matsusaka (2001), Jusko (2015).

4.2.3 Contextual factors

4.2.3.1 Geographic concentration of the party constituencies: This is a contextual factor that affects the actual proportionality of an electoral system without itself being affected by the nature of this system. The less proportional an electoral system, the more likely the certain parties' vote concentration would underestimate the disproportionality in practice. For example, the fact that the Scottish and Irish voters are geographically concentrated in certain areas of Britain, would allow for the vote of the Scottish and Irish parties to be translated into parliamentary representation. Had these ethnic groups been scattered among the English voters geographically, it would be unlikely any Irish or Scottish party would make it to the national parliament. This is true even with the same aggregate composition of the voting outcomes. These two scenarios yield different levels of disproportionality for the same system. However, this discrepancy is not theoretically acceptable. In dealing with a single electoral system, our aim is to understand the impact of the system elements on disproportionality, independent of its application to certain societies with specific identity demographics.

Another case of reduction in disproportionality due to geographic concentration of the vote is the practice of gerrymandering. This is where electoral district boundaries may be redrawn occasionally to correct for change in population size between electoral districts in single-member-district systems (Low-Beer 2014, 343).⁵⁶ While this is not the only purpose for gerrymandering, again it can result in a false and underrated account of disproportionality.

In our simulation approach, we maintain that the geographic concentration of the voting preferences should not be allowed to give a discounted figure for disproportionality since we deal with disproportionality as a systemic and abstract phenomenon. As such, we control for this factor by randomly distributing the party votes among electoral districts.

4.2.4 Structural-Behavioural factors

Over time, voters learn about certain consequences of the electoral rules they are voting under and try to minimise their loss and maximise their gain accordingly by strategically voting in such a manner that their vote makes maximum impact on the election outcome. The final category of factors is concerned with the indirect consequences of structural design of the electoral system, mediated through the voters' cognitive and behavioural adjustments. These consequences include:

- A. Income bias of the turnout
- B. Number of parliamentary parties
- C. Total vote share of the parties that gain representation (parliamentary parties)
- D. Likelihood of a vote distribution pattern (among parliamentary parties) in reality
- E. Strategic voting practices

Factors B, D and E conceal the systemic level of disproportionality in different ways by allowing for behavioural adjustments on the side of the voters (with the exception of the mixed-member proportional system). In the following paragraphs, we explain the venues for this concealment and our strategy to uncover these disproportionalities.

⁵⁶ However if not done properly, Gerrymandering can have adverse effect on proportionality. See Low-Beer (2001) and Bessette and Pitney (2013, ch. 10).

4.2.4.1 Income bias of the turnout: By offering different possibilities for political representation, electoral systems may encourage or discourage electoral participation. Empirical evidence shows that proportional systems and majoritarian systems with small district magnitudes are more conducive to higher turnout than majoritarian systems with large district magnitudes (see Powell 1986; Jackman 1987; Blais and Carty 1990; Jackman and Miller 1995; Franklin 1996; Radcliff and Davis 2000; Kostadinova 2003; Selb 2009 for the former claim and Downs 1957; Owen and Goffman 1984; Palfrey and Rosenthal 1985; Mueller 2003; Kaniovski & Mueller 2006; Electoral Reform Society 2010 for the latter). Reduced participation may be understood as a form of disproportionality when the non-participating segments of the electorate have electoral preferences skewed towards certain parties but they opt out of voting for knowing that under the electoral system in place their vote is not likely to be translated into parliamentary representation.

This is a very common trend in reality. For example, it is known that in the economically developed democracies, reduced turnout is associated with less participation at the lower end of the economic spectrum than its middle or top (see literature review in chapters 2 section 2.2.3 and chapter 5). Given that certain parties are more successful in garnering support from the working class, lower participation would mean a disproportionately lower vote share for such parties. This can be true of any other salient social cleavage, such as ethno-linguistic divisions, when one side of the divide finds elections ineffective in offering it parliamentary representation. Empirical studies fail to capture the effect of this lower participation rate on disproportionality because only de facto voters and parliamentary parties are considered in the calculations. Not those who do not vote and those parties which failed parliamentary representation as a result. A possible theoretical solution for this challenge is to assume a realistic but high level of turnout, that would entail maximum mobilisation of party constituencies and measure how the electoral system would respond under this scenario. This way, the disproportionality disguised behind the non-participation of some segments of the electorate would be exposed.

For the purpose of this study, we assume a universal 90% turnout, which is a maximum threshold that is only rarely crossed in reality in countries where voting is not mandatory. Our simulations deal with actual populations, varying in quantity between hundreds of thousands to hundreds of millions. As previously mentioned, measurement of disproportionality is sensitive to this quantity, but our tentative simulations show that the magnitude of the population size effect is less than 0.1% in the above range of population size. Therefore, any other reasonable assumption about the rate of turnout may be imposed on the simulation without significantly increasing the measurement error.

A key methodological assumption of this research is that the participation rate and the vote share of the first nine parties, in terms of popularity, are homogeneously distributed across all electoral districts of a country. Relaxing this assumption would imply that the impact of district sizes on the overall disproportionality is not proportionate to their electorate magnitude and is weighted by exogenous factors. However, if lower participation in smaller districts is the result of their smaller size⁵⁷, then we are dealing with a structural and endogenous effect. While we admit that our methodology is not capable of accounting for this phenomenon, we have no

⁵⁷ Because it is known that at the national level smaller district magnitude is associated with lower turnout unless the size of the electorate per district is also small (as in New Zealand).

evidence that lower participation at smaller districts is a common routine among countries with proportional or semi-proportional electoral systems and districts of variable magnitudes.

4.2.4.2 Number of parliamentary parties: The likelihood of gaining representation plays a crucial role in voters' decision of whether to vote for a party. Electoral systems that discriminate against parties based on the size or geographical distribution of their vote, encourages voters to strategically switch their vote to parties that have a higher chance of winning seats proportionate to their vote (i.e. larger parties or parties with a geographically concentrated vote base). The immediate result of this behavioural adjustment is a reduction in the number of parliamentary parties, resulting in an underestimation of disproportionality when measured using empirical data. This is the single most impactful behavioural adjustment that corrupts the empirical measurement of disproportionality.

Cancelling this effect would mean to measure the disproportionality of a system, assuming that people act as if they are voting in a maximally proportional system and see how much distortion from proportionality occurs under the existing system. This means that we need to know how many parties would be elected to the parliament under maximum proportionality. Theoretically, this number can be as big as the number of seats in the legislature. But in reality, the figure is often much smaller. This can be a result of the entry thresholds and legal hurdles for party registration, which reduces the number of parties that can practically win seats. Or this can be caused by extra-structural factors that limit the appeal of parties to the electorate in democracies.

Using a semi-empirical approach to determine the number of parliamentary parties, we adopt a hypothetical threshold of entry, and look at the average number of parties winning a vote above that threshold in countries with the most proportional electoral institutions. The threshold for this study is 1% of the total votes as a reasonable compromise between super fragmentation of the party system, and its democratic spirit of representing all ideas. In reality, in most countries, the nominal electoral threshold is between 3% and 5%, which represents a higher compromise on the democratic quality of representation in favour of less fragmentation. In this research, we do not seek to justify a 1% threshold as an ideal or optimal figure. However, given that a threshold theoretically mirrors a compromise on the quality of democratic representation, we intend to investigate in what capacity does this compromise increases disproportionality in an electoral system.

Applying the selected threshold of 1% to a dataset of latest elections in 17 countries with the most proportional electoral systems, we arrive at the rounded number of 9 parliamentary parties (see appendix A). Had we used 3% or 5% thresholds, this figure would have dropped to 7 and 5 parties respectively.

Independent candidates: Because the assumption of partisan politics is principal in the design of this study, the question of independent candidates is only marginally accommodated in our design. Independents may be considered as parties with a single candidate. Parties that win only one seat in our modelling are in a way identical to independents. Nonetheless, because only 9 parties are assumed to have enough votes to enter parliament ($v_i > 1\%$), independents represent a small portion of simulation results. As such, our modelling may significantly differ from the reality of electoral systems that allow for or even encourage the participation of independents.

4.2.4.3 Share of the parliamentary parties from total vote: Once we decide on the number of parties to be used in the simulation, using the database of 17 most proportional countries used above, we would discover that about 98% of the total vote goes to those parties with more than 1% of the vote share (see appendix A). Like the level of participation, this has a tiny effect on the measurement of disproportionality, reducing the overall rate of electoral turnout for the parliamentary parties to 88.2% ($= 90\% \times 98\%$).

4.2.4.4 Likelihood of a vote distribution pattern (among parliamentary parties) in reality: a second behavioural factor with significant influence on disproportionality is the distribution of vote among parliamentary parties. In theory, this can be any random distribution, but in reality many of the distribution forms only happen rarely. Even under the most proportional systems, we are witness to a concentration of vote among a few parties (usually 3 or 4 at most). This observation is irrespective of the electoral system and may be considered as a contextual factor in the measurement of disproportionality. Under less proportional systems (which often discriminate against smaller parties), voters further concentrate their vote to fewer parties to make an impact on the election outcome. This latter behavioural adjustment is what our simulation seeks to control for; rather than the former for which we have no explanation.

The simulation approach to the measurement of disproportionality relies on averaging disproportionality over a large sample of random electoral outcomes. Since most electoral systems are biased against smaller parties, if the distribution of uniform and skewed samples is not representative of what happens in reality, then disproportionality will be overestimated because uniform distributions, which are less likely in reality and yield a higher disproportionality, are more frequent in the sample than in the population. To address this issue, we turn to the database of the most proportional countries one more time to extract the range of variation in the vote of the parties ranked 1st to 9th in real elections to set the limits for our generator of random voting outcomes (appendix B). These limits and the algorithm for creating random samples between them will be elaborated in section 4.4.

4.2.4.5 Strategic voting: in section 4.2.4.2, we discussed the type of strategic voting that is a behavioural adjustment by the voters in response to their awareness of the structural disproportionality built into the electoral system. This kind of behaviour usually serves to disguise a portion of disproportionality in empirical measurement. Here, we need to deal with a different form of strategic voting that only occurs under the mixed-member proportional electoral system (MMP). What makes mixed-member systems specific in this regard is that unlike other electoral systems, strategic voting under mixed-member systems may increase the manifest disproportionality that is empirically measurable.

Under mixed-member proportional systems, every voter casts two votes: an *electorate vote* for a candidate in a single-member-district and a *party vote* for a party at the national level. Each vote determines the fate of a certain portion of the seats.

Currently, MMP is only used at the national level in Germany, Bolivia, Lesotho and New Zealand. The German version of the system bases final allocation of seats on the party vote and allows for adjustment in the seats of other parties when the electorate seats won by a party are more than its proportionally allocated seats in the parliament⁵⁸ (Pukelsheim 2014, 184). This is called a fully compensatory system, which allows an increase in the size of parliament to achieve vote-

⁵⁸ This is known as “Overhang Seats” problem

seat proportionality. This system creates no incentive for voters to cast their two votes differently for different parties. In the New Zealand version of the system, parliament has a nominal size of 120, 70 of which are electorate seats. The electoral system distributes all 120 seats among parties based on the distribution of their party votes. However, if a party wins more electorate seats than what it could get based on its share of the party vote, the extra seats (called overhang seats) are awarded, without compensation, to other parties. Here too, size of the parliament may exceed its nominal size of 120.⁵⁹ Voters, whose preferred party candidate has no chance of winning an electorate seat, cast their party vote based on their preference but cast their electorate vote for a candidate they opposed least. In effect, joining forces with the voters of that party to beat the candidate of the party they opposed most. This results in less popular parties gaining seats simply because of the strategic vote that supporters of other parties cast for them to block the victory of their adversaries (Vowles 2014, 28-30; Lundberg & Miller 2014, 214). For example, in the 2014 general election of New Zealand, “United Future” party gained 0.83% of the seats in the legislature (1 electorate seat) by winning only .22% of the party votes. This was made possible by the majority of the National Party supporters, in the electorate of Ohariu, casting their electorate vote for the otherwise very unpopular party United Future, which was closest to their electoral platform (see figure 4.2).

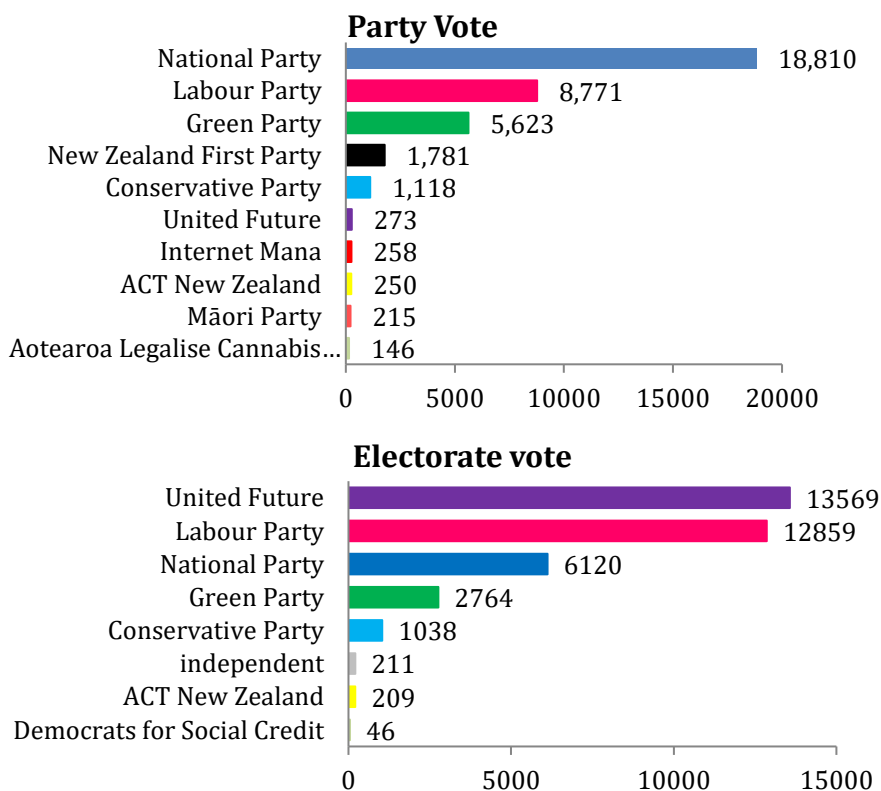


Figure 4.2

An example of strategic voting under the New Zealand MMP system
(Ōhāriu electorate 2014 general election)

Data source: New Zealand Electoral Commission

(http://www.electionresults.govt.nz/electionresults_2014/electorate-36.html)

⁵⁹ one extra list seat was added in the 2005 election and 2011 election, and two extra list seats in the 2008 election

This type of strategic voting increases disproportionality by offering seats to parties that lack a significant vote base of themselves. While the overall amount of disproportionality caused by strategic voting under mixed-member proportional systems may not be very large, this is still a structural effect of the electoral system that needs to be included in modelling to gain an accurate understanding of the allocative quality of these systems.

Table 4.1 gives a summary of all structural, behavioural and contextual determinants of electoral disproportionality that were introduced in this section.

Table 4.1

Factors contributing to electoral disproportionality

Type	Variable	Inclusion in this research
Structural	Electoral formula (d_{ef})	Included
	District magnitude(s) (d_{dm})	
	Entry thresholds (natural, legal) (d_{th})	
	Quotas (d_q)	
	Levelling mechanism (d_l)	
	Number of election rounds	Not included
	Bicameralism	
	Ballot structure	
	VEP/VAP ratio	
	Hurdles to party nomination	
Structural-contextual	Size of the legislature (d_s)	Included
Contextual	Geographic concentration of vote	Controlled for
Structural-Behavioural	Rate of electoral turnout	Controlled for (held at 90%)
	Number of parliamentary parties	Controlled for (held constant to the average of the most proportional countries)
	Combined vote share of parliamentary parties	
	Probable patterns of vote distribution	
	Strategic voting (d_{sv})	Included in New Zealand MMP

4.3 Simulation model and its components

Based on the discussion in the previous section, a synthesis can now be made of all the structural effects of an electoral system and the way they contribute to its overall disproportionality. Equation 4.3 presents the model used for the simulations. Disproportionality is a function of all seven structural factors listed below.

$$\begin{aligned} \text{electoral disproportionality} &= f(d_s, d_{ef}, d_{th}, d_q, d_{dm}, d_{sv}, d_l) = \\ &a_1 d_s + a_2 d_{ef} + a_3 d_{th} + a_4 d_q + a_5 d_{dm} + a_6 d_{sv} - a_7 d_l + b \end{aligned} \quad (4.3)$$

with a_i s capturing their respective effects, while b refers to the residual effect of other factors not included in this modelling. The seven structural factors are:

- d_s : size of the legislature
- d_{ef} : electoral formula
- d_{th} : entry threshold
- d_q : minority quotas
- d_{dm} : district magnitude
- d_{sv} : strategic voting
- d_l : levelling mechanism

Since the levelling mechanism always reduces disproportionality, its effect is demonstrated with a negative sign in formula 4.3. In this section, we explain the reference point for the measurement of each of the seven variables included in the model.

4.3.1 Size of the legislature (d_s)

Sub-section 4.2.2.1 introduced the compromise between proper representation and practicalities of maintaining an oversized legislature when determining an ideal size for the parliament. A non-linear formula that is widely popularized in the political science for this purpose is the cube root of the population (Rein Taagepera 1973, Lijphart 1999, 154; Auriol & Gary-Bobo 2007):

$$\text{Optimal size of the legislature} = OSL_P = \sqrt[3]{\text{population size}} \quad (4.4)$$

According to Taagepera, this formula was first proposed by James Parker Smith (Hence the subscript P) in 1910 to describe the relation between votes and seats in the British Parliament. Yet, he contends that while different avenues have been investigated to explain this relation, “there is no obvious reason for the regularity expressed by the cube law” (Rein Taagepera 1973, 258). Since there is consensus in the field over the use of this formula, this research uses it as a point of departure in searching for an ideal size for the legislature. Though, this formula has certain theoretical flaws that need to be modified.

OSL_P takes the entire population rather than the of voting age population (VAP) as the basis for its calculation. Two countries with equal population sizes may have totally different demographic structures and hence very different number of eligible voters. This is illustrated in figure 4.3 where the electorate size and population size are projected against each other.

If all countries had similar electorate to population ratios, we would expect no deviation from the fitted line.

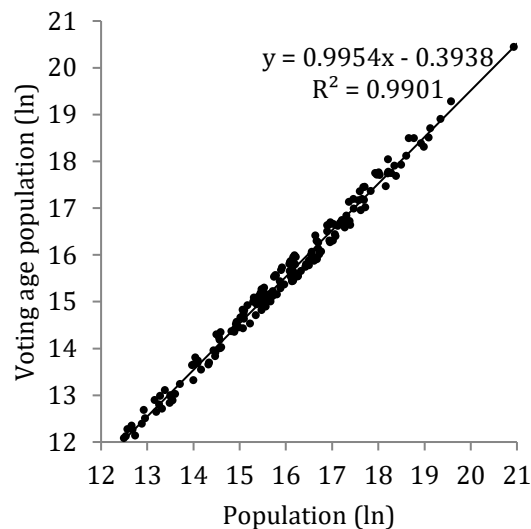


Figure 4.3

Size of the eligible voters compared to the size of population for 179 states and dependencies

Data: Voter Turnout Database, International IDEA

(<https://www.idea.int/data-tools/data/voter-turnout>)

Since it is the ratio of voters to seats that affects proportionality, the calculation of an ideal legislature size must be based on the size of the voting age population. But rather than challenging the rationale behind the very established cube root idea, we intend to arrive at similar outcomes by applying the formula to the electorate sizes, instead of the entire population, by manipulating the power coefficient in the formula. Because now VAP is the basis for the calculations, to arrive at a new power coefficient we first plot the cube root of P ($\sqrt[3]{P}$) and the cube root of VAP ($\sqrt[3]{VAP}$) when countries are ranked in ascending order by VAP. Figure 4.4 illustrates those two curves in red and blue respectively. We then fit an exponential curve of the form $y = a e^{bx}$ to the $\sqrt[3]{P}$ curve. The fitted curve is shown as a dashed line in figure 4.4).

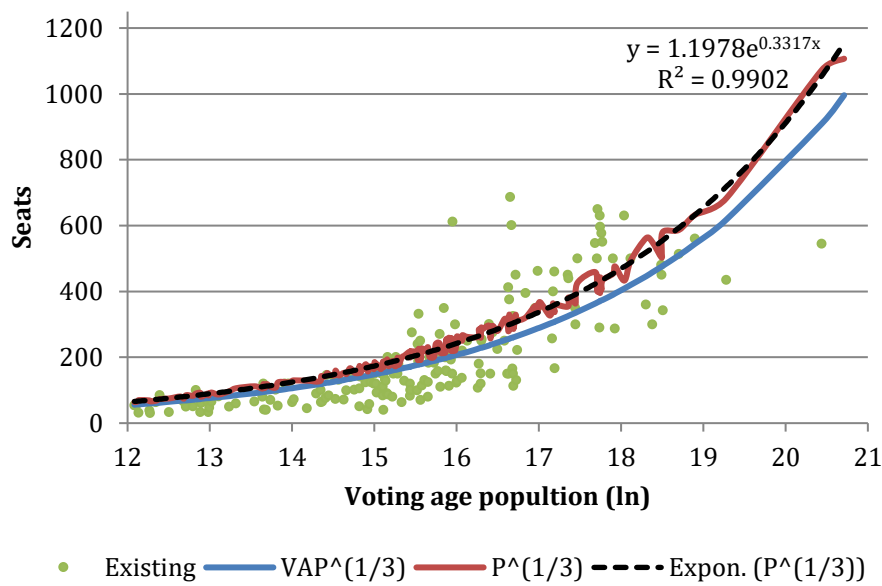


Figure 4.4

Estimation of the Optimum Size of the Legislature (Lower House)

Note: China is not included in the graph for better visibility ($\ln(E)=20.67$, $S=2987$, $OSL_P=1106$, $OSL_A=1246$)

Data: Voter Turnout Database, International IDEA (<https://www.idea.int/data-tools/data/voter-turnout>)

This fitted line is represented by the equation:

$$S_1 = f(P) = 1.1978 e^{0.3317 P} \quad (4.5)$$

and is 99% fitted to OSL_P . The ultimate goal of the adjustment is to propose a function in the form of $OSL_A = \sqrt[n]{VAP}$ which satisfies the following two conditions:

1. an exponential function that fits to OSL_A best, is identical in coefficient and power to S_1
2. OSL_A is as progressive and critical as OSL_P in the sense that the same percentage of existing legislatures have a size less than what is proposed by OSL_P

Using these criteria the fitted exponential curve would be:

$$S_2 = f(VAP) = 1.1978 e^{0.3317 VAP} \quad (4.6)$$

with an R^2 coefficient of 99.9% with $\sqrt[n]{VAP}$ when $n = 2.914$. For simplicity, we round the n figure to 2.91 so the corresponding OSL_A formula for this fitted line is:

$$\text{Optimal size of the legislature} = OSL_A = \sqrt[2.91]{VAP} \quad (4.7)$$

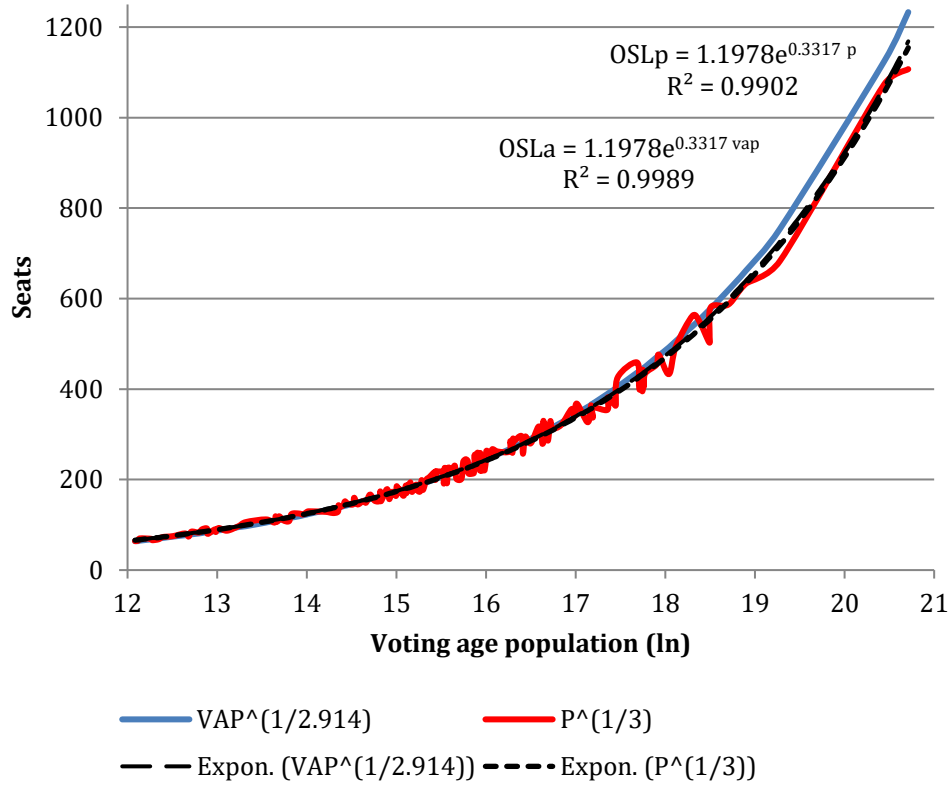


Figure 4.5
 OSL_A , $f(P)$ and $f(E)$

Both Parker's approach and OSL_A offers a larger than existing size for the legislature in 78% of the cases in a database of 179 states and dependencies (see appendix B for details).

Having a reference point for the proper size of the parliament, enables us to compare the amount of disproportionality caused by the real size of the parliament. In 22% of the cases, the parliament size is larger than suggested by OSL_A . In these instances, the actual size of the parliament may be taken as the point of reference for comparison.

4.3.2 Electoral formula (d_{ef})

Although no electoral formula is purely proportional, the highest achievable proportionality is attributable to the largest remainder method (LRM) (see appendix C for elaboration). In this research, disproportionality of the LRM (d_{ef}^{LRM}) is set at zero and disproportionality caused by other methods is compared to this reference point.

$$d_{ef}^{LRM} = 0 \quad (4.8)$$

4.3.3 Threshold (d_{th})

In section 4.2.4.2, we argued for a hypothetical 1% entry threshold instead of a naturally dictated threshold as a compromise for over-fragmentation. We take the disproportionality caused by a 1% electoral threshold for granted and compare the effect of higher thresholds with it.

$$d_{th}^{TH=1\%} = 0 \quad (4.9)$$

It is shown (appendix A) that in practice an average of 9 parties often cross this threshold in countries with the most proportional electoral systems. In our database of 179 states and dependencies with an electorate size of 150,000 or more, for which demographic data is available, about 89% have a natural threshold of less than 1%. However, 20 cases have a higher natural threshold due to the size of the legislature being smaller than 100 (see appendix B). The smallest of such entities is New Caledonia, with the ideal size of the parliament estimated at 69, yielding a natural threshold of 1.45%. Although a maximum of 0.45% difference with our hypothetical 1% threshold barely results in a different estimation for the size of the parliamentary parties, wherever D_a is to be measured for such countries, the reference point needs to be set at the natural threshold of their ideal-sized parliaments (1.45% in this example) and voting patterns, containing at least one party with a vote below this threshold, have to be discarded from the sample.

4.3.4 Quotas (d_q)

Apart from the gender quota, as an example of social electoral quota, other quotas associated with race, language, religion, or certain geographical regions of a country are modelled in our simulations. Apparently, the effect of quota on disproportionality is zero when there is no quota:

$$d_q^{No\ quota} = 0 \quad (4.10)$$

This is taken as the reference point of measurement for d_q . This does not mean that adoption of quota in an electoral system is naturally undesirable. Quotas of non-elected seats (e.g. the partial appointment of MPs by the monarch or junta (such as in Myanmar⁶⁰) or the automatic appointment of ex-officio members (e.g. Pinochet's senatorship-for-life status in Chile⁶¹, DRC⁶², Burundi⁶³) may be opposed on normative grounds. Nonetheless, quotas usually represent compromises between two democratic qualities: proportionality and representation of minorities. Thus, although our approach to the measurement of disproportionality interprets quota as a deviation from the desirable quality of proportionality, it must be acknowledged that quota may enhance the democratic character of the state by empowering the underprivileged

⁶⁰ Cheesman, Nick, Monique Skidmore, Trevor Wilson, and Institute of Southeast Asian Studies, eds. *Ruling Myanmar: From Cyclone Nargis to National Elections*. Singapore: Institute of Southeast Asian Studies, 2010, p.33

⁶¹ Garretón Merino, Manuel A. *Incomplete Democracy: Political Democratisation in Chile and Latin America*. Latin America in Translation/En Traducción/Em Tradução. Chapel Hill: University of North Carolina Press, 2003, p.160

⁶² AfricanConstitutions.org (<http://www.africanconstitution.org/home/congo-drc>)

⁶³ ASSECAA (http://www.assecaa.org/English/MemberCouncils/senate_of_burundi.htm)

minorities. Still, the very fact that our method can single out and isolate the effect of quota on disproportionality, allows for a better analysis of other sources of disproportionality in a system. Without doubt, a more qualitative consideration of quotas and the justifications for them in every country-case would allow for a fairer assessment of the disproportionality figures measured through quantitative methods.

4.3.5 District magnitude (d_{dm})

In the absence of a national levelling, the district magnitude that may guarantee maximum proportionality is a single nationwide district equal to the size of the legislature (DM=S). So it is assumed that the contribution of such districting to disproportionality is zero, compared to all other patterns of splitting a country into electoral districts.

$$d_{dm}^{DM=S} = 0 \quad (4.11)$$

4.3.6 Strategic voting (d_{sv})

Under the New Zealand MMP, there will be no distortion from proportionality if discrepancy between party vote and electorate vote of the voters is not high enough to distort the results from an allocation purely based on the party vote. We call this the condition of *no effective strategic voting* which is represented as follows:

$$d_q^{No\ effective\ strategic\ voting} = 0 \quad (4.12)$$

In the absence of any correction mechanism, any effective strategic voting may induce some disproportionality to the election results.

4.3.7 Levelling (d_l)

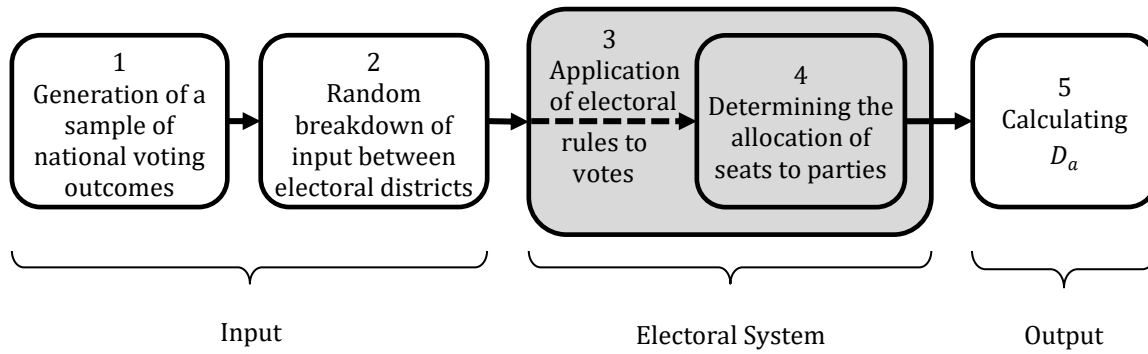
Levelling is generally achieved by reserving a certain portion of seats for final reallocation, with the possibility of varying the size of the legislature. It serves to offset the contribution of other factors to disproportionality of an electoral system. The gain from levelling would be maximized when proportionality is restored to the level offered by the LR allocative mechanism in a nationwide electoral district.⁶⁴ Since levelling offsets the disproportionality, its effect is negative in size. Maximum effectiveness is achieved when levelling manages to cancel the entire disproportionality caused by other factors. We take this situation as the reference point for the effect of this component on the disproportionality of the electoral system.

$$d_l^{LR, DM=S} = -(d_{al} + d_{dm} + d_{th} + d_q + d_s + d_{sv}) \quad (4.13)$$

4.4 Simulation procedure and algorithm

Figure 4.6 outlines the schematic diagram of the five phases of the simulation method.

⁶⁴ It must be noted that levelling does not cancel the effect of exogenous behavioural or contextual factors such as the size of population and turnout etc. and is not a remedy for the residual disproportionality as per formula 4.3.

**Figure 4.6**

Procedure for the calculation of disproportionality using simulation method

In the first phase, a sample of voting outcomes at the national level is produced and fed into the simulation algorithm. The production of this sample and its characteristics is explained in section 4.5. Voting outcomes are broken down in the second phase, between local electoral districts (unless the electoral system uses a unitary national district for seat allocation). The process for vote partition is explained in the section 4.6. At the end of the second phase, input data is ready to be imported into the simulation algorithm. The third and fourth phases (which will be dealt with in more detail in chapter 5), involve the application of electoral rules to the party votes. Depending on the design of the electoral system, these two phases usually get intertwined. In the third phase, thresholds are applied and the parties eligible to participate in each round of seat allocation are decided. In the fourth phase, the electoral formula is applied to the vote to decide the winner of each seat in the election. Finally, in the fifth phase, seat allocation results are aggregated at the national level and passed into the disproportionality measurement module of the simulation algorithm, where a disproportionality index (in this study D_a) is calculated as the final output.

4.5 Generation of random samples of voting outcomes as input to the simulation model

As previously explained, the simulation approach to the measurement of disproportionality involves the generation of a large sample of probable voting outcomes, and feeding it into an electoral system. The resulting disproportionality of the iterations is then averaged to achieve a final figure of disproportionality for the system in hand.

While randomness has to be guaranteed in the input sample, the distribution of samples must possess similar characteristics with the distribution of actual voting outcomes in countries with the highest levels of proportionality. For this purpose, a dataset is composed using the results of the last three elections in 17 countries from our sample with the highest predicted systemic electoral proportionality. We call this dataset VX. From this dataset, we extract minimum,

maximum, average and standard deviation of the vote share for parties ranked 1st to 9th in all elections.⁶⁵

We then create a sample of randomized voting outcomes that shares the four abovementioned statistical characteristics. Size of the sample is chosen at 10,000 units. Although sample and observational data share similar statistical characteristics, feeding the simulation with a large sample, instead of a small observational dataset like VX, is advantageous because the large sample includes multiple patterns of voting that fall within the boundaries of empirically likely voting outcomes but are not necessarily included in the VX dataset.

4.5.1 The sample generation algorithm

We now explain the algorithm used for the creation of random sample units.

Step 1: nine random decimal values are being produced in the range [0,100] to create vector $\mathbf{R} = \{r_1 \dots r_9\}$. The $\mathbf{R}$ vector represents an initial party vote share vector and its elements are expressed in percentages.

Step 2: the value of each r_i is scaled to the range of minimum and maximum value of each party's vote share in the VX dataset as per formula 4.14 to produce r'_i . Figure 4.7 illustrates the mean, maximum ($P_{i\max}$) and minimum ($P_{i\min}$) limits of vote share of each of the nine parties in the VX dataset.

$$r'_i = r_i \times (P_{i\max} - P_{i\min}) + P_{i\min} \quad (4.14)$$

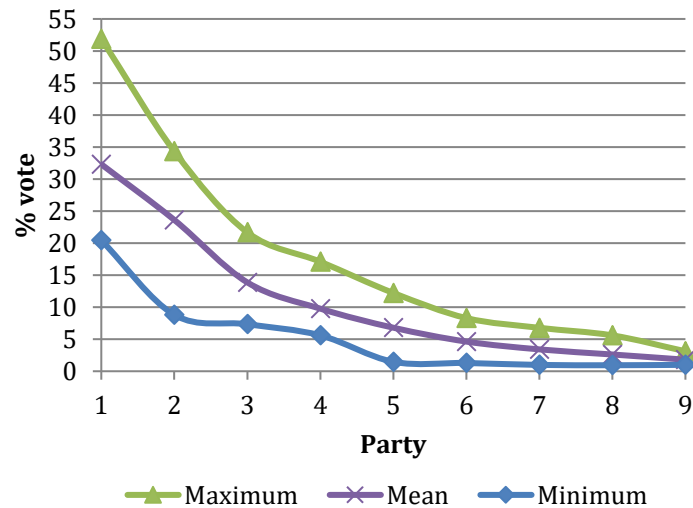


Figure 4.7

Range of variation in the vote of the largest 9 parties with vote share exceeding 1% in 17 countries with the most proportional electoral systems.

⁶⁵ In some elections in our dataset, less than nine parties have passed a 1% electoral threshold. All observations include at least 5 parties with 96.3% having a 6th party, 85.19% with a 7th party, 66.67% with 8 parties and only 40.74% involving a 9th party.

Step 3: The vector of adjusted random values ($\mathbf{R}'$) is assessed against two criteria:

- The r'_i values should be in descending order going from the most popular party (P_1) to the least popular party (P_9) as per the definition of electoral popularity.
- The sum of $\mathbf{R}'$ is equal to $100\% \pm 5\%$.

If either of the criteria are not met, the $\mathbf{R}$ is discarded and the algorithm goes back to step 1. Otherwise, it proceeds to step 4.

Step 4: If both conditions in step 3 are met, then all individual r'_i s are scaled up or down (by the same proportion) according to formula 4.14, such that their sum equals to 100%.

$$v_i = r'_i \times \frac{100\%}{\sum_{i=1}^{parties} r'_i} \quad (4.15)$$

Now $\sum v_i = 100\%$. The new vector is called $\mathbf{v} = \{v_1 \dots v_9\}$

If the initial difference of $\sum_{i=1}^{parties} r'_i$ from 100% is too much (for example 20 or 30 %), then scaling will push r'_i s very close to their average in the sample and reduces the variance of the sample. The condition of maximum 5% variation around 100% is imposed to discard the $\mathbf{R}'$ vectors that will cause reduction in the sample variance if included.

Step 5: in the last step, each $v_i \in \mathbf{v}$ is tested to lie in the allowable range $[P_{i \min} - P_{i \max}]$. If this condition is met, then the $\mathbf{v}$ is qualified for addition to the sample.

The whole process is repeated as many times as necessary to arrive at the intended sample size (here 10,000 units).

Figure 4.8 compares the mean and the standard deviation for the vote share of every party in the sample with the VX dataset. Although the standard deviation of the generated sample is slightly lower than the VX dataset for second to eighth parties, this difference is 0.8 units at maximum, allowing to assume an ideal fit between the sample and observed data.

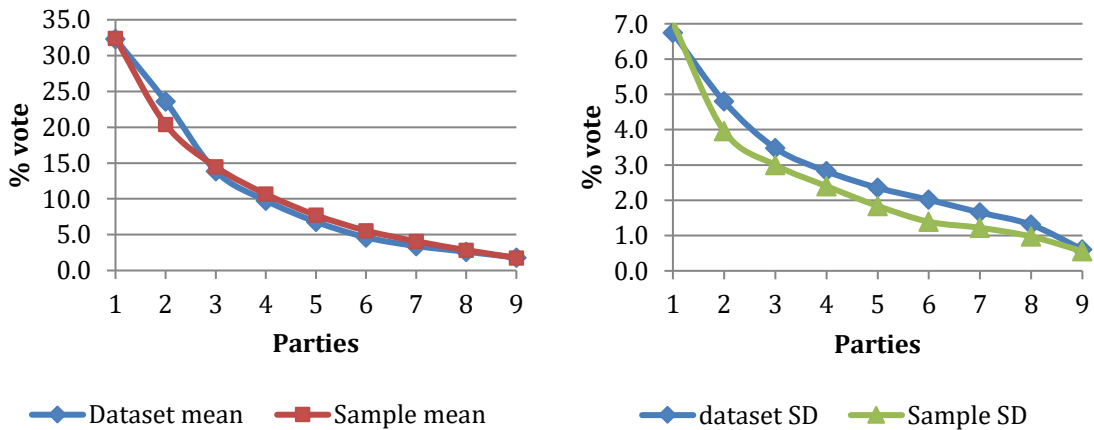


Figure 4.8

Comparison between the mean and standard deviation of the generated sample and observed data

4.6 Breakdown of the national vote into local electoral districts

In most electoral systems, fate of the seats is decided in single-member districts (SMD) or multi-member electoral districts (MMD). Therefore, knowing the national distribution of the votes among parties is not enough to determine the allocation of seats in the parliament. In chapter 4, we presented our methodology to create a random sample of national voting outcomes to feed into the simulations as input. This sample consists of 10,000 units and bears characteristics similar to the voting patterns observable in countries with the most proportional electoral system designs. To use this sample of voting outcomes in simulation, we need to find a solution for breaking down each sample unit between electoral districts. To tackle this problem, we need to develop a mathematical solution to achieve random split of the votes among districts with known voting eligible populations. Here we explain this solution and prove that it fulfils three constraints:

1. guaranties our intended number of voting population per every district
2. guaranties our intended overall number of votes per parties
3. guaranties a random breakdown of the national vote between districts

Assume that we have p parties and d districts. Total vote of party i is shown as P_i and total voters in district j is shown as D_j . Matrices P and D represent the total votes of all parties and the total voters in all districts respectively.

$$\mathbf{P} = [P_1 \quad P_2 \quad \dots \quad P_p] \quad (4.16)$$

$$\mathbf{D} = \begin{bmatrix} D_1 \\ D_2 \\ \vdots \\ D_d \end{bmatrix} \quad (4.17)$$

In the first step, the vote of each district is randomly divided (bars and balls partition problem) between parties to form matrix $\mathbf{V}$ with rows representing districts and columns representing parties:

$$\mathbf{V} = \begin{bmatrix} v_{11} & v_{12} & \dots & v_{1p} \\ v_{21} & v_{22} & \dots & v_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ v_{d1} & v_{d2} & \dots & v_{dp} \end{bmatrix} \quad (4.18)$$

By construction, the total sum of row i of matrix $\mathbf{V}$ is equal to the total sum of voters in district i :

$$\forall i \ 1 \leq i \leq D: \sum_{j=1}^p v_{ij} = D_i \quad (4.19)$$

We define matrix $\mathbf{C}$ as the total sums of votes in the columns of matrix $\mathbf{V}$; meaning that, the total vote parties gain in the initial random split of the votes:

$$\mathbf{C} = [C_1 \quad C_2 \quad \dots \quad C_p] \text{ where: } C_j = \sum_{i=1}^D v_{ij} \quad (4.20)$$

Unless by pure accident, the sums of votes in each column of matrix $\mathbf{V}$ do not necessarily correspond with the total intended vote of the respective party, i.e.:

$$\mathbf{C} \neq \mathbf{P}$$

To make mathematical representation of the problem easier, we assume that parties receiving more votes in total than their given national vote (i.e. $C_j \geq P_j$), are the first m parties and for parties $m+1$ to p : $C_j < P_j$. If parties do not happen to naturally fall in this order after random partition of the votes, we reorder the columns of matrix V to arrive at the above order.

Now, we define matrix V' using sums and ratios of the random numbers in matrix V (which are random by the same token) and prove that the total sum of each row of this matrix is equal to the number of voters in the respective district. Plus, the total sum of each column is equal to the total intended votes of each party as per matrix P . Matrix V' may be described as:

$$V' = \begin{bmatrix} v_{11} & v_{12} & \dots & v_{1m} & v_{1m+1} & \dots & v_{1p} \\ v_{21} & v_{22} & \dots & v_{2m} & v_{2m+1} & \dots & v_{2p} \\ \vdots & \vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\ v_{d1} & v_{d2} & \dots & v_{dm} & v_{dm+1} & \dots & v_{dp} \end{bmatrix} \quad (4.21)$$

$\underbrace{\hspace{10em}}_{C_j \geq P_j} \quad \underbrace{\hspace{10em}}_{C_j < P_j}$

$$v'_{ij} = \begin{cases} v_{ij} \frac{P_j}{C_j}, & 0 \leq j \leq m \\ v_{ij} - \left[\sum_{k=1}^m v_{ik} \left(\frac{P_k}{C_k} - 1 \right) \right] \times \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)}, & m < j \leq p \end{cases} \quad (4.22)$$

Theorem A: for every district (rows of matrix V') the total sum of votes of all parties is equal to the sum of voters in that district.

$$\forall i \ 1 \leq i \leq d: \sum_{j=1}^p v'_{ij} = \sum_{j=1}^m v'_{ij} + \sum_{j=m+1}^p v'_{ij} = D_i \quad (4.23)$$

Theorem B: for every party (columns of matrix V') the total sum of votes in all districts is equal to the intended vote of that party.

$$\forall j \ 1 \leq j \leq p: \sum_{i=1}^d v'_{ij} = P_j \quad (4.24)$$

Proof of theorem A:

First, we replace the v'_{ij} elements with their equivalent formulas built from the elements of matrix V .

$$\begin{aligned} \sum_{j=1}^m v'_{ij} + \sum_{j=m+1}^p v'_{ij} &= \sum_{j=1}^m v_{ij} \frac{P_j}{C_j} + \sum_{j=m+1}^p \left\{ v_{ij} - \left[\sum_{k=1}^m v_{ik} \left(\frac{P_k}{C_k} - 1 \right) \right] \times \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \right\} \\ &= \sum_{j=1}^m v_{ij} \frac{P_j}{C_j} + \sum_{j=m+1}^p \left\{ v_{ij} - \left[\sum_{k=1}^m v_{ik} \left(\frac{P_k}{C_k} \right) - \sum_{k=1}^m v_{ik} \right] \times \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \right\} \end{aligned}$$

let S to be defined as: $S = \sum_{j=1}^m v_{ij} \frac{P_j}{C_j}$

Then:

$$\begin{aligned}
 \sum_{j=1}^p v'_{ij} &= S + \sum_{j=m+1}^p \left\{ v_{ij} - \left[S - \sum_{k=1}^m v_{ik} \right] \times \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \right\} \\
 &= S + \sum_{j=m+1}^p v_{ij} - \sum_{j=m+1}^p \left\{ \left[S - \sum_{k=1}^m v_{ik} \right] \times \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \right\} \\
 &= S + \sum_{j=m+1}^p v_{ij} - \frac{S - \sum_{k=1}^m v_{ik}}{\sum_{k=m+1}^p (C_k - P_k)} \sum_{j=m+1}^p (C_j - P_j) \\
 &= S + \sum_{j=m+1}^p v_{ij} - \left(S - \sum_{k=1}^m v_{ik} \right) \frac{\sum_{j=m+1}^p (C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \\
 &= S + \sum_{j=m+1}^p v_{ij} - \left(S - \sum_{k=1}^m v_{ik} \right) = \sum_{j=m+1}^p v_{ij} + \sum_{k=1}^m v_{ik} \\
 &\quad \sum_{k=1}^m v_{ik} + \sum_{j=m+1}^p v_{ij} = \sum_{j=1}^p v_{ij} = D_i
 \end{aligned}$$

Proof of theorem B:

- when $0 \leq j \leq m$:

$$\sum_{i=1}^d v'_{ij} = \sum_{i=1}^d v_{ij} \frac{P_j}{C_j} = \frac{P_j}{C_j} \sum_{i=1}^d v_{ij} = \frac{P_j}{C_j} C_j = P_j$$

- when $m < j \leq p$:

$$\begin{aligned}
 \sum_{i=1}^d v'_{ij} &= \sum_{i=1}^d \left\{ v_{ij} - \left[\sum_{k=1}^m v_{ik} \left(\frac{P_k}{C_k} - 1 \right) \right] \times \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \right\} \\
 &= \sum_{i=1}^d v_{ij} - \sum_{i=1}^d \left\{ \left[\sum_{k=1}^m v_{ik} \left(\frac{P_k}{C_k} - 1 \right) \right] \times \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \right\} \\
 &= C_j - \sum_{i=1}^d \left\{ \left[\sum_{k=1}^m v_{ik} \left(\frac{P_k}{C_k} - 1 \right) \right] \times \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \right\} \\
 &= C_j - \sum_{i=1}^d \left\{ \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \times \sum_{k=1}^m v_{ik} \left(\frac{P_k}{C_k} - 1 \right) \right\} \\
 &= C_j - \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \sum_{i=1}^d \sum_{k=1}^m v_{ik} \left(\frac{P_k}{C_k} - 1 \right) \\
 &= C_j - \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \sum_{k=1}^m \sum_{i=1}^d v_{ik} \left(\frac{P_k}{C_k} - 1 \right)
 \end{aligned}$$

$$= C_j - \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \left\{ \sum_{k=1}^m \left[\sum_{i=1}^d v_{ik} \frac{P_k}{C_k} - \sum_{i=1}^d v_{ik} \right] \right\}$$

but when $k \leq m$: $\sum_{i=1}^d v_{ik} \frac{P_k}{C_k} = P_k$ so:

$$\begin{aligned} \sum_{i=1}^d v'_{ij} &= C_j - \frac{(C_j - P_j)}{\sum_{k=m+1}^p (C_k - P_k)} \sum_{k=1}^m P_k - C_k \\ &= C_j - (C_j - P_j) \frac{\sum_{k=1}^m (P_k - C_k)}{\sum_{k=m+1}^p (C_k - P_k)} \\ &= C_j - (C_j - P_j) \frac{\sum_{k=1}^m (P_k - C_k)}{\sum_{k=1}^m (P_k - C_k)} \\ &= C_j - (C_j - P_j) = P_j \end{aligned}$$

Because elements of matrix $\mathbf{V}$ are all produced as random numbers and the formula for creating $\mathbf{V}'$ solely uses sums, the partial sums, or ratios of these random numbers to calculate the elements of $\mathbf{V}'$, the latter matrix also bears the randomness character of the former.

When a national voting outcome is broken down between electoral districts, it can be loaded into phases 3 and 4 of the algorithm to calculate the allocation of seats to parties.

4.7 Summary

This chapter critically reviewed the empirical approach to the measurement of disproportionality of electoral systems. We argued that the empirical approach is only capable of measuring the *disproportionality of the voting outcomes* but not the *systemic disproportionality of the electoral system* because the empirical measurement fails to control for the behavioural adjustments of the voters in response to the electoral rules. In less proportional systems, empirical measurement may partially mask the true level of electoral disproportionality of the electoral system, which would have been observable had people voted as if they are voting in a proportional system.

We also elaborated on the notion of optimum size for the legislature and how to calculate it.

Finally, as a substitute for the empirical measurement, this chapter proposed a method based on computer simulation. In this approach, a computer program that simulates an electoral system and its details, is fed with a large pool of synthesized voting outcomes likely to happen in countries where the most proportional electoral systems are in use. The chapter was concluded by explaining the Algorithm for the generation of this sample, the assumptions governing this process, and the random breakdown of each sample unit between local electoral districts.

The next chapter will present our simulations to report the D_a index for 92 electoral systems used around the world in democratic countries.

Chapter 5

Measurement and decomposition of systemic disproportionality using the D_a index and the simulation methodology for 92 democracies

5.1 Introduction

In chapter 3, a modified index was introduced for the measurement of electoral disproportionality and its characters were explained. In chapter 4, a simulation method was proposed to be used with indices of disproportionality to allow for an accurate measurement of structural disproportionality of electoral systems. Simulation technique can control for a variety of factors affecting disproportionality which may not be accounted for when using real election data for the measurement purpose (empirical method). Most important, simulation is capable of endogenising ‘the behavioural question’, or as Duverger (1951) used to call it, ‘*the psychological effect*’, which refers to the adaptation of voters’ voting behaviour to the constraints of the electoral system with the intention to maximise the impact of their vote on the outcome of the election (Blais & Massicotte 2002).

As mentioned in chapter 4, the simulation method that we use also allows for the decomposition of disproportionality along various components of an electoral system; components such as electoral formula, electoral threshold, size of the legislature or relative size of electoral districts, structure of districting, and seat apportionment in the districts. In this chapter we use the simulation methodology to measure the D_a index for 92 country-cases divided into twelve classes of electoral systems. These classes are categorised in four broad families, including (1) proportional (PR), (2) semi-proportional (semi-PR), (3) parallel, and (4) majoritarian. Through these simulations, on the one hand we intend to exhibit capabilities and advantages of our methodology, and on the other hand we seek to provide an accurate measurement of disproportionality for a wide range of countries representing a variety of electoral systems. These results will be utilised in chapter 6 to investigate the relation between electoral disproportionality and economic inequality around the world.

In the following sections, first the criteria for choosing countries to be examined will be explained (section 5.2), and some aspects of the measurement methodology will be discussed in more detail (section 5.3). Issues with universal relevance to all simulations will be elaborated on in this section while matters of particular concern in the simulation of different families of electoral systems will be deferred to their respective sections. Next, some criteria will be introduced for the classification of electoral systems, and a list will be provided of all countries

included in the study from each electoral family and class (section 5.4). We then move on to present the detailed results of our simulations for 10 countries that showcase characteristics of their respective classes of electoral systems (sections 5.5 to 5.8). These cases are selected not only because their electoral systems are typical examples of their groups, but also because they entail interesting features that show how the design of an electoral system impacts its functioning. In each case, only the most recent version of the electoral law will be analysed while at the same time we touch upon the historical evolution of some aspects of the electoral system that matter to its current level of disproportionality. These in-depth reviews help to understand the effect of different components and modules of an electoral system on its disproportionality under a variety of electoral designs. In the final section (section 5.9), the aggregate level of disproportionality will be presented using the D_a index for all 92 countries investigated in this research without the case-by-case review of the legal structure of the electoral systems or decomposition of the index. These results will be used to compare the disproportionality of different classes of electoral systems. We also juxtapose our findings with the results reported in two well-known empirical studies of electoral disproportionality.

5.2 Study Sample

For this study, we exclude countries with either of the following characteristics:

- a. countries with dependencies and disputed territories
- b. countries that are war-torn or occupied countries or countries with failed states
- c. countries with less than 250,000 population

These criteria leave us with 161 cases from which to choose as many democratic regimes as possible for simulation. Deciding which country may be called a democracy and which one may not, is a question of degree. Different indices produced to quantify the concept of democracy do not necessarily tell the same story. To decide whether a country is democratic enough to be included in the sample three established indices of democracy were consulted. These include:

1. The Freedom House's "Freedom in the World" index (FIW)⁶⁶,
2. The Polity IV project's democracy index produced by centre for systemic peace (PIV)⁶⁷,
and
3. *The Economist's* index of Democracy (EUI)⁶⁸

These indices are produced annually by observing a multiplicity of factors that may influence political democracy. PIV varies in the range of [0,10]. On top of the quantitative measurement, FIW and EUI offer a qualitative interpretation of the index values. FIW's range of [0-100] is split into three segments. Countries with a score below 32 are defined as 'Not Free', those with a score above 32 but below 70 are defined as 'Partly Free', and a score of 70 or above fall in the 'Free' category. The EUI index varies in the range [0-10]. Range [0-4] on this index is interpreted as 'Authoritarian Regime', [4-6] as 'Hybrid Regime', [6-8] as 'Flawed Democracy', and [8-10] as 'Full Democracy'.

⁶⁶ <https://freedomhouse.org/report-types/freedom-world>

⁶⁷ <https://www.systemicpeace.org/polity/polity4.htm>

⁶⁸ <http://www.eiu.com/topic/democracy-index>

For this study, we limit our choices to countries which are either ranked as ‘Partly Free’ or ‘Free’ on FIW index (score 37-100), or ‘Hybrid’ or ‘Democratic’ regime on the EIU index (score 6-10), or scored 5 or higher on the PIV index. The list consists of 118 countries that constitute the final base from which we try to simulate the electoral system of as many countries as possible.

On the question of the inclusion of hybrid regimes in the study, first, there is little agreement among democracy rating institutions over the exact definition of hybrid (a.k.a. partly free) regimes. They present scorings and categorizations that sometimes clearly contrast with each other. Second, all three rating sources used in this study, allocate a democracy score to countries over a continuous scale. As such, countries in the hybrid category vary largely in the proximity of their score to democratic or authoritarian categories. Many of the countries included in our study are borderline cases between free (democratic), and partly free (hybrid) classes and have been consistently improving their democracy score over the study period.

Case selection is limited by: (a) availability of data on the structure of the electoral system or its context of implementation, or (b) theoretical limitations on the simulation of certain majoritarian electoral designs. Latter constraints are explained in section 5.8.

In total, the most recent electoral systems in 92 countries are simulated. Table 5.1 presents a list of cases studied in this research and their broad electoral system families.

Table 5.1

List of countries studied in this research

Proportional	Semi-Proportional		Parallel	Majoritarian	
Austria	Albania	Italy	Armenia	Bahamas	Madagascar
Bulgaria	Belgium	Latvia	Burkina Faso	Bangladesh	Malawi
Denmark	Benin	Lesotho	Georgia	Barbados	Maldives
East Timor	Bolivia	Luxembourg	Hungary	Belize	Nigeria
Fiji	Brazil	Macedonia	Japan	Bhutan	Pakistan
Kosovo	Cape Verde	Morocco	Lithuania	Botswana	Sierra Leone
Kyrgyzstan	Colombia	Mozambique	Mexico	Canada	Solomon Islands
Moldova	Costa Rica	New Zealand	Panama	Chile	South Korea
Montenegro	Croatia	Nicaragua	Russia	Ghana	Tanzania
Namibia	Cyprus	Niger		India	Trinidad & Tobago
Netherlands	Czech Republic	Paraguay		Jamaica	UK
Norway	Ecuador	Peru		Kenya	USA
Serbia	El Salvador	Poland		Liberia	Zambia
Slovakia	Finland	Portugal			
Slovenia	Germany	Spain			
South Africa	Guatemala	Sri Lanka			
Sweden	Guyana	Suriname			
	Honduras	Togo			
	Iceland	Turkey			
	Indonesia	Uruguay			

In Figure 5.1, democracy scores of countries included in this research are compared to those not included using data of indices FIW(2017), EUI(2015) and PIV(2015). FIW offers democracy measurement for 167 countries qualified based on our criteria covering all 92 cases of this

study. The EUI provides estimations for 160 countries of which 86 are included in the sample and the PIV dataset contains data for 162 qualified countries, including 87 of our selected cases.

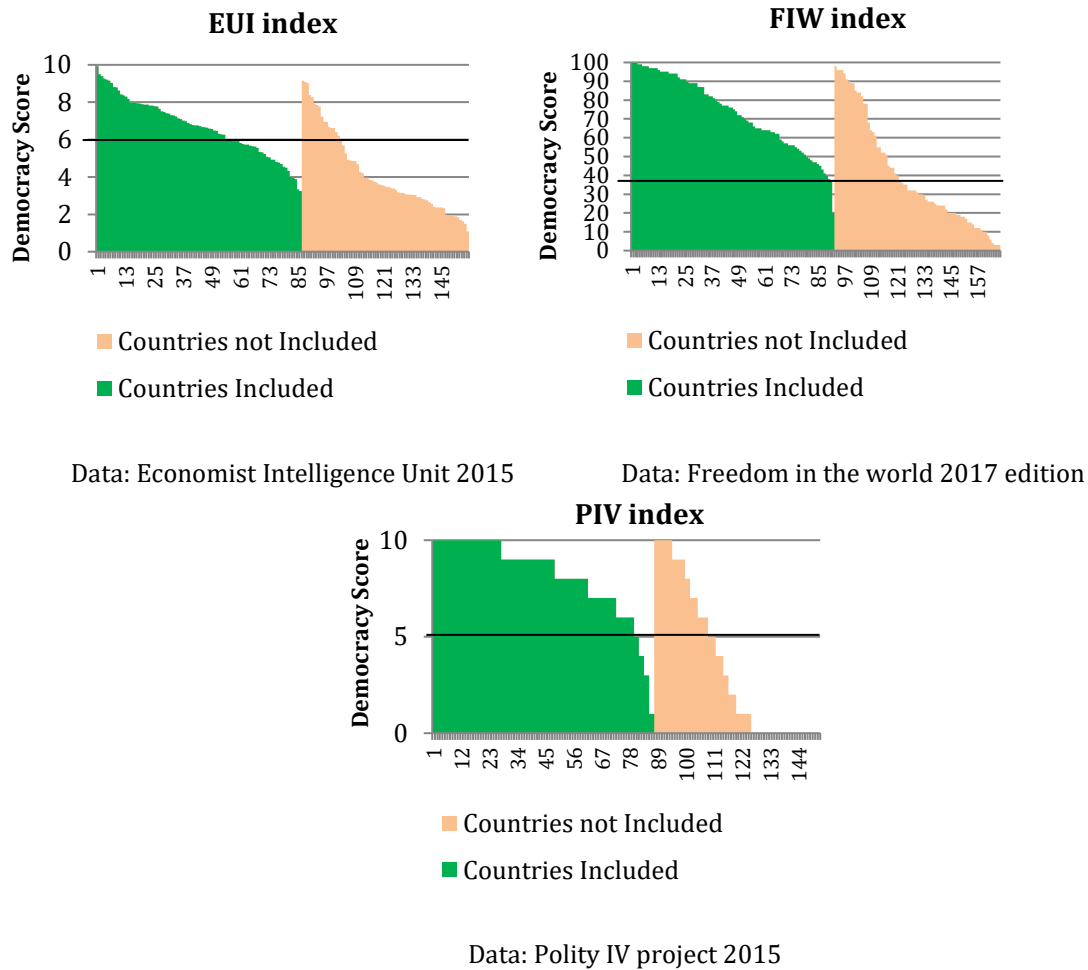


Figure 5.1

Distribution of democracy score among countries selected for this research

Table 5.2 contrasts the cumulative number and percentage of countries above certain democracy score that are included in this study using the FIW index (data year: 2017) with those for countries that were excluded. As an indicator of representativeness of our sample, this table shows that 77% of 'Free' countries (FIW > 70) and 71% of 'Free' or 'Partly Free' countries (FIW > 32) are included in this study.

Table 5.2

Distribution of countries by their democracy score

Democracy Score	% countries included in the sample	% countries not included in the sample	# countries included
>10	58%	42%	92
> 20	64%	36%	91
> 30	71%	29%	91
> 40	76%	24%	88
> 50	77%	23%	79
> 60	78%	22%	67
> 70	77%	23%	51
> 80	75%	25%	38
> 90	81%	19%	25

Data: Freedom House “Freedom in the World” 2017 edition

5.3 Practical methodological considerations

In section 4.4 of the previous chapter, we introduced a parametric model to estimate the disproportionality of electoral systems based on seven design elements, including: the size of the legislature, the electoral formula, the electoral threshold, the structure of districting, strategic voting and the existence of levelling mechanism. We described the simulation model as:

$$D_a = f(d_s, d_{ef}, d_{th}, d_q, d_{dm}, d_{sv}, d_l) = a_1 d_s + a_2 d_{ef} + a_3 d_{th} + a_4 d_q + a_5 d_{dm} + a_6 d_{sv} - a_7 d_l + error \quad (5.1)$$

The amount of disproportionality induced by any component of an electoral system is in part dependent on the design of its other components. For example, the effect of electoral threshold on disproportionality is in inverse relation to the average district magnitude. The larger the districts the higher the overall disproportionality produced by the electoral threshold would be. In other words, the correct model involves interactions between variables and may be written in the following extended form:

$$D_a = f(d_s, d_{al}, d_{th}, d_q, d_{dm}, d_{sv}, d_l) = a_1 d_s + a_2 d_{ef} + a_3 d_{th} + a_4 d_q + a_5 d_{dm} + a_6 d_{sv} + a_7 d_l + b_{12} (d_s \times d_{ef}) + b_{13} (d_s \times d_{th}) \dots + b_{67} (d_{sv} \times d_l) + error \quad (5.2)$$

Depending on the purpose of the research, this model may be estimated for a reasonably homogenous group of electoral designs. However, often electoral studies are geared toward the practical question of minimizing disproportionality in a specific country in the presence of *de facto* constraints such as the demographics of that country, its institutional history and balance of political forces for or against electoral reforms. As such, our approach in this study is to focus on proposing a method for decomposing disproportionality of individual electoral systems of countries and show how manipulation in the design of these systems can alter their level of disproportionality. At the same time, we present the average disproportionality of different electoral system classes to offer a general comparison between broad designs with two degrees of freedom (district magnitude and seat allocation mechanism). Estimating models for each

family of systems is one step beyond the scope of this research although the methodological framework for that purpose is already laid down in this study.

Further, the focus of this chapter in the simulation of electoral systems is exclusively on the measurement of disproportionality meaning that as we explain the structure of electoral systems in sections 5.5 to 5.8, each of the electoral systems may involve additional delicacies and design elements that are omitted from the simplified scheme of the system presented. As an example, in proportional, semi-proportional and parallel families of electoral systems, an important question beyond the allocation of seats to parties is to decide which party candidates to receive the seats won by the party. The whole discussion around open and closed lists and preferential voting is concerned with the above question. Yet, insofar as parties (rather than the candidates) are taken as the units of analysis, such issues do not affect the inter-party seat distribution and are hence overlooked in this study.

Because the focus of chapters 3 and 4 was mainly on the theoretical aspects of measuring disproportionality, we refrained from explaining the practical methodological matters that are involved in the conduct of the simulations. This section is concerned with those practical considerations regarding the simulation of some specific aspects of the electoral systems.

5.3.1 Interpreting Panachage

Literally meaning cocktail or mix, panachage is a form of ticket splitting in proportional systems. In this system, each voter in a multi-member district can vote for as many candidates in their districts as there are seats to be filled. On each ballot paper, candidates may be chosen from different electoral lists. Voters are even allowed to vote twice for some candidates (called cumulation). If the number of voters is P and the number of seats to be filled is S , then the total number of votes would be $P \times S$. Vote for each party is calculated as the total number of votes cast for the candidates of that party. Seats are distributed among parties based on their share of the total votes. Among the candidates of each party, seats go to candidates in the order of their received personal vote (Grofman 2007, 89).

The nature of panachage puts it closer to a preferential proportional system called 'Single Transferable Vote' (STV) used in Malta and Ireland (Taagepera 2007, 42). Panachage is used in Honduras, Ecuador, El Salvador, Switzerland, and Luxembourg. All of these countries use a variant of local district system (as in the semi-proportional family (see section 5.4)). Because panachage requires active engagement of the voters in reviewing multiple lists and choosing the right candidates to list on their ballots, use of the panachage is generally limited in electoral systems wherever this option is on offer. Marsh (1985) reports only 8% use of panachage by voters in Switzerland.

Panachage violates the logic of voter-party association by allowing voters to split their vote among multiple parties. This may seem to pose a challenge to the measurement of disproportionality as the concept of proportionality involves a seat allocation proportionate to the party choice of all voters. But what if individual voters are allowed to be represented by multiple parties?

The answer may be found in the way votes are translated into seats under panachage. In the vote counting process, seats are divided between the parties in proportion to the vote share of all of their candidates. This means that in the end of the day, every single vote matters in determining the outcome of the election to a degree found in simple proportional systems. This

fact puts panachage in contrast to other preferential voting systems such as MNTV, TRS and AV in which each voter can vote for more than one party because in the latter case only some of these votes matter to deciding the outcome of the election (see section 5.8 and appendix C for the elaboration of the problem). From the methodological perspective, the workaround for the simulation of a panachage system is simply to assume that instead of P voters in an electoral district we are dealing with $P \times S$ voters (full utilisation of the panachage) when S is the number of district seats.

5.3.2 Dealing with the minority quota

Requirements for minority representation may be enforced in two broad forms. One is to adopt the '*bridging approach*' by encouraging parties to develop multi-ethnic, cross-cleavage base of support. The main focus of this approach is to push parties to seek pre-election deals with the minorities as a requirement for electoral nomination or to set thresholds of segmental vote⁶⁹ that parties need to cross to be able to enter the parliament. Although less common, this approach may be implemented in the form of quota too. In this application, parties are required to allocate a certain portion of their electoral lists or final seats to minorities. For example, in Pakistan 60 seats of the parliament are reserved for women and 10 for non-Muslim citizens to be distributed between the parties in proportion to the seats that they win in the election. This form of quota is not of concern in this study because eventually minorities are represented by major parties through pre-election pacts implying that minorities have been given certain bargaining power against the rest of the political community.

The second form of the minority quota has a very different connotation and is built on what is known as the '*bonding approach*'. In this approach, the political system urges the minority communities to seek independent representation in the legislature through their own parties. In these cases, the quota comes in the form of a certain number of seats reserved for the parties that exclusively represent a minority group. 10 countries in this study use some form of bonding minority quota. These include four former Yugoslavian republics of Serbia, Montenegro, Slovenia, and Croatia along with Poland, Bolivia, Columbia, Niger, Denmark, and New Zealand.

The quota structures in these countries may be categorised into three groups in the order of emphasis on separation of political representation of the minority communities and the rest of the society. We continue by introducing each group and the strategy of this research in dealing with each type of quota in simulation.

1. Reserved districts: in this design, certain electoral districts are devised for the members of minority communities to vote in. However, representation is not restricted to segmental parties⁷⁰, and all parties can run candidates in these districts. Such an arrangement puts this category somewhere between the bridging and bonding designs.

In Niger, 8 single member districts (in a 171 seat parliament) are created in certain areas for members of 8 minority groups to vote in. In New Zealand, 7 single member electorates that jointly cover the entire territory of the country are dedicated to voters who identify themselves as ethnic Māoris. These districts geographically overlap with the 64 normal single member districts that jointly partition the entire New Zealand territory. People of Māori descent are free to choose to register either in their

⁶⁹ Vote of a certain segment of the society such as a province, an ethnic, religious or lingual minority

⁷⁰ Parties that are registered as exclusively representing a minority group (i.e. a segment of the society)

designated Māori district or in the respective normal local district where they reside. Any party can seek representation from the Māori people in their electorates. In Bolivia, the country is split between 9 MMDs. The territories of 7 of these districts, constitute 7 SMDs reserved for the indigenous minority voters.

Simulation strategy: Because in this design representation of the minorities is not exclusive to the minority parties (i.e. the minority voters are allowed to vote for any party that they prefer), usually it does not result in extra fragmentation of the party system and election outcomes are not much different from when there are no reserved electoral districts for the minorities. Therefore, no specific provision is developed in the simulation of these systems.

2. Lower entry threshold for the minority parties: some systems reduce the threshold of representation for parties or coalitions of parties that exclusively represent a minority community. In this design, no fixed number of seats is reserved for the minorities. However, because a custom threshold provides easier access to parliamentary representation it may be loosely interpreted as a quota system. In Serbia, there is no explicit quota but minority parties enjoy a discounted electoral threshold of 0.4% of the national vote as opposed to 5% for normal parties. Similarly, in Poland, the legal threshold is waived for the parties that represent minority ethnic groups and, since Poland uses local districting, minority parties only need to pass the natural threshold of representation emanating from the limited size of electoral districts. Montenegro applies different thresholds to the ethnic parties of different minority communities (see section 5.5.3 for details).

This design has two simultaneous effects. On the one hand, by lowering the electoral threshold for the minority parties, it randomly waives the universal threshold for some parties (but not for all). Still, this function serves to reduce disproportionality because it undermines the negative effect of the universal threshold. On the other hand, this design allows for some parties to win seats that would otherwise have not been able to gain seats due to their limited vote base. It was explained in chapter 4 (section 4.2.4.2) that this research assumes a threshold of 1% for parliamentary representation. Based on this assumption, minority parties that are subject to lower than 1% electoral thresholds in an actual electoral system will be eliminated by the simulation algorithm suggesting that lack of an arrangement for minority quota increases disproportionality.

To tackle this problem, in our simulations: (a) we randomly waive the universal threshold for a few of the parties that have a vote share of more than 1% but less than the universal threshold; and (b) in distributing seats among parties, we leave a certain number of seats aside and allocate them afterward to parties that have less than 1% vote but are endowed with parliamentary representation as a result of the quota-threshold design. Decision on how many parties to waive the threshold for and how many seats to set aside for ethnic micro-parties is made on a case by case basis by investigating demographics and the structure of the party system in the country that is being modelled.

3. Guaranteed seats: finally, in the most restrictive form of bonding design, certain electoral districts are devised to voters of minority communities and only the minority

parties are allowed to run for seats in these electorates. In Slovenia, 1 SMD is devised to either of Hungarian and Italian minorities while these minorities are simultaneously allowed to cast a second vote for the ordinary candidates as well. In Croatia, 8 (out of 151) seats are reserved for ethnic minorities. Each minority (or group of minorities for smaller minorities) elects one MP except for the Serbian community who elects 3 MPs. In Denmark, 2 seats are reserved for the Faroe Islanders and 2 for the Greenlanders despite their low relative population sizes. In Colombia, a double member district is dedicated to the parties exclusively representing Afro-Colombians and a single member district is designated for the indigenous Colombians.

Simulation strategy: our investigation shows that in most cases parties that win seats due to the quota arrangement are short of 1% vote share that is assumed necessary for entering the parliament in our simulation.⁷¹ As a result, our interpretation of such micro-parties is identical to what was explained for the second design of quota system meaning that they are always assumed to increase disproportionality.

Although it is beyond the scope of this research, it must be noted that simply because quota may increase disproportionality it is not to be understood as an awkward element in an electoral system. Rather, quota may be normatively justifiable on other grounds. Table 5.3 gives a summary of the above discussion.

Table 5.3

Different designs of bonding minority quota and the strategy used in their simulation

Threshold Type	Country	Total seats	Reserved districts /seats	%	Electoral system ²	Simulation strategy
Reserved districts	Niger	171	8	4.7%	Local D'Hondt	No specific arrangement
	New Zealand	121+	7	5.8%	MMP	
	Bolivia	130	7	5.4%	MMP	
Lower electoral threshold	Serbia	250	9.4 ¹	3.8%	Natl. D'Hondt	Random waiver of universal threshold for some parties + allocation of some seats to micro-parties
	Montenegro	81	2.5 ¹	3.1%	Natl. D'Hondt	
	Poland	460	1.5 ¹	0.3%	Local D'Hondt	
Reserved seats	Denmark	139	4	2.9%	Compensatory	Allocation of some seats to micro-parties
	Colombia	166	3	1.8%	Local Hare	
	Croatia	151	8	5.3%	Local D'Hondt	
	Slovenia	90	2	2.2%	Natl. D'Hondt	

¹ Calculated from the election data: Serbia 2007-16, Montenegro 2012-16, Poland: 1997-2015

² See chapter 6 and appendix C for descriptions.

5.3.3 Demographics and the calculation of OSL_a

The optimum size of the legislature (OSL_a) figures calculated on voting age population estimations by CIA factbook 2014 are reported in appendix B. Because in this chapter we are dealing with concrete examples of elections and they are held at different years, we rely on election statistics released by the national electoral commissions of countries prior to every election. This data reports the size of the voting-eligible population (VEP) in electoral districts. So, if there is a sizable discrepancy between the voting-eligible and voting age populations

⁷¹ The Serb minority in Croatia is an exception.

(VAP) in a country in an election due to voter registration hurdles etc., the OSL_a figure reported in this chapter might underestimate the true size of the OSL_a because we makes no assumptions about the justifiability of discrepancy between the VAP and VEP figures reported in the data. Further, as reminded in the previous chapter where OSL_a figure for a country stands below the actual size of the parliament, we use the latter figure for its OSL_a to avoid introducing disproportionality measurement error due to discrepancy between these two figures.

$$\text{if } OSL_a < S \Rightarrow OSL_a = S \quad (5.3)$$

5.3.4 The D_a measurement as a time dependent procedure

As a final methodological note, because disproportionality in part stems from contextual factors, including the size of the voting-eligible population per electoral districts, each measurement of electoral disproportionality is time dependent and is based on the demographic information of the pertaining country at the time of the simulation. Although the effect of contextual factors is more limited in comparison to the structural factors, still, D_a needs to be reported for specific years. Because demographic information is usually released at the onset of every election, the time variable for each country that is included in this study is set to the date of the most recent election for which data was available to the authors at the time of conducting this research.

5.4 Classification of electoral systems

Electoral systems may be categorised in different ways based on various aspects of their design or their consequences (such as the effective number of parties in parliament, the degree of fragmentation of the party system, representation of minorities and disproportionality). Rae (1967) proposes a categorisation based on the ballot structure, district magnitude and electoral formulae. Cox (1990) categorised electoral systems based on five variables: the ballot structure (number of votes per voter), district magnitude, electoral formula, the possibility of partial abstention, and possibility of cumulation. Based on this categorisation he distinguishes between 11 classes of electoral systems.

In reality there is a wide heterogeneity in the design of electoral systems either between different families of systems or even between countries within each family (Blais & Massicotte 2002, 40). As a result, the estimation of model parameters would be very inaccurate for a universal sample or otherwise careful attention has to be paid in selection of a homogenous group of electoral systems/countries. For the purpose of this research, we adopt electoral formula (the seat allocation mechanism) and the structure of the districting as the definitive attributes of the electoral systems classes. On this basis, six broad families may be discerned:

1. Proportional
2. Semi-proportional
3. Parallel
4. Strong bicameral with opposing systems for the lower and upper chambers
5. Majoritarian
6. Confessional (based on social quotas for sub-groups of the society)

Implied by the ordering of these families is the fact that disproportionality generally increases towards the bottom of the list. Nonetheless, empirical observation suggests that placing a country in one of these families does not necessarily mean that its disproportionality is in

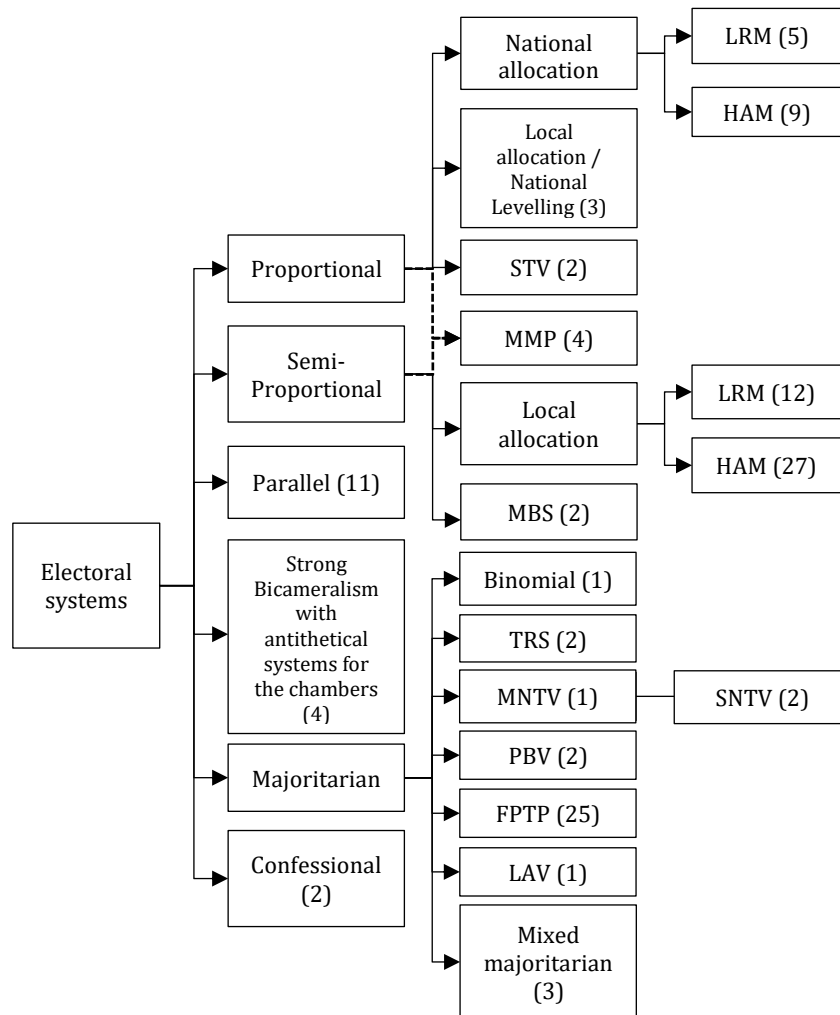
ordinal relation with countries in the adjacent families because although we based the categorisation on the two major sources of disproportionality, other aspects of the electoral systems such as the electoral thresholds may also have significant impacts on the overall level of disproportionality of a system. For instance, one case with a proportional electoral system and an electoral threshold may eventually exhibit higher disproportionality than a semi-proportional case without such threshold. In this research, two families of electoral systems (families 4 and 6) are not studied because defining proportionality in such cases is theoretically problematic.

In our database of 118 democratic or semi-democratic countries, 22 have legislatures with strong higher chamber. Among these, four countries (Australia, Dominican Republic, Argentina, and Switzerland) represent strong bicameralism with opposing electoral systems for the upper and lower chambers. Australia has a semi-proportional electoral system for the election to its Senate while its House is elected by Alternative Vote (AV) which is a majoritarian electoral system (see section 5.8). In the other three cases, lower houses are elected by a variant of proportional system while senate's composition is determined by majoritarian rules. In these examples decision making is neither the result of a proportional legislature nor one formed by the majority rules. Rather, the two chambers of the parliament most likely need to cooperate and compromise on a regular basis in order to decide on the bills. Such systems fall somewhere between the two extremes by intuition. However, in theory, the calculation of disproportionality is in a sense meaningless in this design; because there can be two figures one for each chamber and there is no good theoretical reason (and procedure) to combine the two for an ultimate numerical value for disproportionality. Therefore, those countries with strong bicameral legislatures are excluded from this study.

The other family for which theorizing disproportionality is problematic is the confessional systems. Confessional systems are implemented in societies with deep active social cleavages in order to accommodate conflicting social groups typically distinguished by ethnicity, language and religious affiliation. Vehicles for this purpose may be quotas for identity communities that inhabit the country or eligibility conditions for qualification of parties and candidates. Such rules may for example require parties to represent and garner support among several communities. The two exemplary cases in this family are Lebanon and Bosnia and Herzegovina both inheritors to bitter civil wars and peace accords with strict rules for political power sharing among adversary communities (Hadzovic & Gaub 2008, 96; Zahar 2009). In such countries, more than anything else, elections is a mean to allow for intra-community competition and to minimise inter-community political interactions. Therefore, politics in deeply divided countries is less about the ideologies than the rigid loyalties to clustered and segregated ethnic or religious sub-groups. When parties can barely bridge across the synthetic lines of social division, representation may for the most part be proportional to the country's ethno-linguistic or religious composition than anything else. This stalemate alters the political landscape and the meaning of politics in such a way that the concept of proportionality can barely explain anything about the electoral system because the electoral system's *raison d'être* is not to accommodate competing political ideologies (Suleiman 1967; Nelson 2013). Since electoral politics in the confessional systems runs within communities and not between them, general election may be thought of as a set of simultaneous and independent elections to several legislatures (Arnautović 2015, 38) that ultimately combine to form the national legislature. Consequently, we can have multiple figures for disproportionality related to these simultaneous

elections yet averaging or any other form of combining those figures is not necessarily supported by theory.

Figure 5.2 illustrates the six broad families of electoral systems in our typology and 13 classes under these families. In section 5.9 where the measurement results are presented for all cases in the sample, countries are listed using this classification.



Abbreviations:

HAM: Highest average method (D'Hondt, Modified Sainte-Laguë, Sainte-Laguë)

MNTV: Multiple non-transferable vote

AV: Alternative vote

PBV: Party block vote

MBS: Majority bonus system

MMP: Mixed-member proportional

LRM: Largest remainder method (Hare-Niemeyer)

TRS: Two-Round System

SNTV: Single non-transferable vote

LAV: Limited alternative vote

FPTP: First past the post a.k.a. plurality

STV: Single transferable vote

Figure 5.2

Classification of electoral systems of 118 democracies

Note: numbers in parentheses denote number of countries

In figure 5.3 different classes of electoral systems are placed on a graph that qualitatively compares them by their average district magnitude and the proportionality of their electoral

formula. This comparison is based on the literature of electoral studies as well as measurements carried on in this chapter.

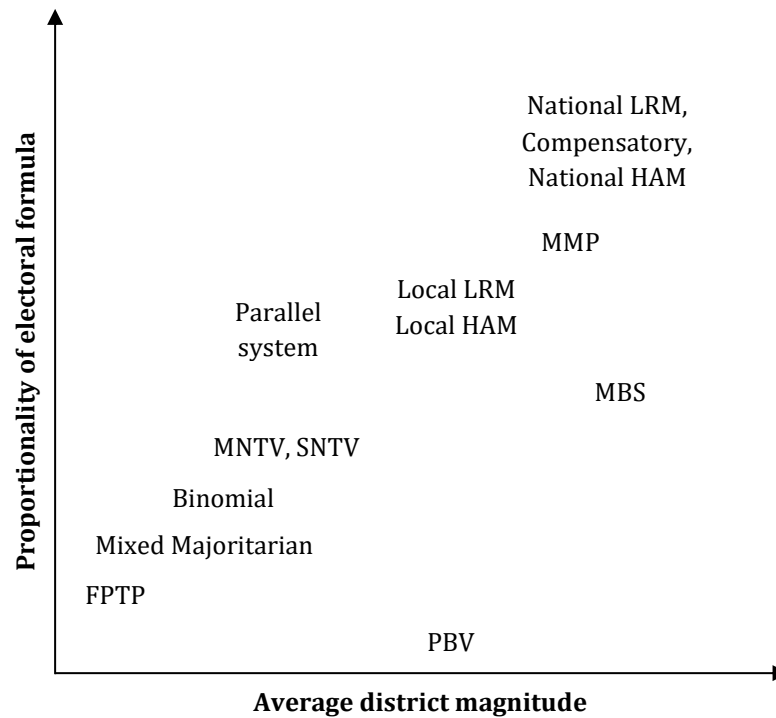


Figure 5.3

Families/classes of electoral systems compared by average district magnitude and proportionality of the electoral formula

What is shown in figure 5.3 is only a very general and abstract assessment which does not allow for precise comparison between pairs of actual electoral systems. In section 5.3, it was mentioned that disproportionality is sensitive to the interaction between different components of an electoral system. For example, at a fixed average district magnitude, a certain electoral formula can result in different disproportionality when the structure of districting varies. Also, at a fixed average district magnitude, different electoral formulas can result in disproportionalities that are not commensurate to their abstract theoretical representation. Now, with the simulation technique in hand, we can present this hitherto known character of the electoral systems in precise numbers. Table 5.4 depicts 12 electoral designs for a legislature with 20 seats and a VEP of 2 million individuals. The average district magnitude is 2 seats per district in all designs but the structure of districting and electoral formula vary between these designs. There are two districting structures. In one structure there are 10 districts each with a magnitude of 2, whereas in the other structure there are 5 single member districts and 5 triple-member districts. District populations are 100,000, 200,000 and 300,000 respectively in districts sizing 1, 2 and 3. Simulations in this example are carried out using the 10000 unit sample produced for this research. 9 parties are contesting the election and there is no electoral threshold.

Table 5.4

An example of the effect of districting and electoral formula on the level of disproportionality

VEP	Size of the legislature	Structure of districting	Average District Magnitude	VEP per district	Electoral formula	D_a (%)
2 million	20 seats	10 DMDs	2	District Magnitude * 100,000	Hare-Niemeyer	19.59
		5 SMDs + 5 TMDs				18.88
		10 DMDs			Sainte-Laguë	22.83
		5 SMDs + 5 TMDs				22.09
		10 DMDs			Modified Sainte-Laguë	26.40
		5 SMDs + 5 TMDs				25.93
		10 DMDs			D'Hondt	27.15
		5 SMDs + 5 TMDs				27.31
		10 DMDs			SNTV	18.14
		5 SMDs + 5 TMDs				17.25
		10 DMDs			FPTP	34.59
		5 SMDs + 5 TMDs				37.56

Abbreviations: SMD: Single member District, DMD: Double Member District, TMD: Triple-Member District, VEP: Voting eligible population

Figures in table 5.4 indicate that the structure of districting and not just the average district magnitude influences the disproportionality. Moreover, the use of electoral formulas with different district sizes can result in surprising outcomes. Here, for example SNTV which is a majoritarian electoral formula produces the least disproportionality because of its very small district sizes.

In the next four sections, we explain the main characteristics of each family of the electoral systems and the main classes nested in each. We further decompose disproportionality of the electoral systems along their constituent components in 10 exemplar countries with interesting elements in the design of their electoral systems.

5.5 The electoral disproportionality of proportional systems

Proportional electoral systems in our classification are those which distribute seats in a unitary district or have a levelling mechanism. Regardless of the electoral formula these designs generally result in a very low disproportionality unless other components in the design of the electoral system push the index higher. Average disproportionality in this family is 6.06%.⁷²

5.5.1 National allocation by LRM (case study: South Africa)

This system is used in five countries: South Africa, Namibia, Bulgaria, Moldova, and Kyrgyzstan. Because of its unique structure of thresholds, Kyrgyzstan is a clear outlier in this class and exhibits a very high disproportionality in the simulations. Kyrgyzstan aside, the average disproportionality in this class is 5.44%.

⁷² Excluding Kyrgyzstan

The South African Electoral system

The current South African electoral system is one of the least disproportional ones in use in the democracies. The South African parliament has 400 members well above its OSL_a figure of 358. The electoral system in South Africa is closed-list proportional and there is no electoral threshold in the system. During the Apartheid era a First-Past-the-Post (FPTP) system was in use with severe restrictions on the participation of the black majority (Reynolds 2004). Foundations of the current system were laid upon the transition of South Africa to democracy in 1994 and has been in use with minor changes regarding party and voter registration since.⁷³ Choice of the electoral system at that time was a compromise by the parties representing the black majority (especially the African National Congress) because it was feared that continued use of the majoritarian system would wipe out the political representation of the white minority (Southall 2001; Reynolds 2004).

In each election, half of the MPs are elected from a national electoral district while the other half are elected from 9 multi-member districts based on the provinces of the country. Despite the existence of provincial districts, vote is first aggregated at the national level to determine the overall allocation of the seats among the parties. So, in reality, the provincial level has no impact on the vote-seat ratio of the parties.

The seat allocation procedure

After vote is aggregated at the national level, first, a quotient of votes per seat is calculated using the Droop quota (proposed in 1868) or Hagenbach-Bischoff quota (proposed in 1888):

$$\text{Hagenbach – Bischoff quota} = \left\lceil \frac{V}{S+1} \right\rceil \quad (5.13)$$

$$\text{Droop quota} = \left\lfloor 1 + \frac{V}{S+1} \right\rfloor \quad (5.14)$$

V is the total number of votes and S is the size of the legislature. Dančišin (2013) clarifies that the two formulas represent the same thing.

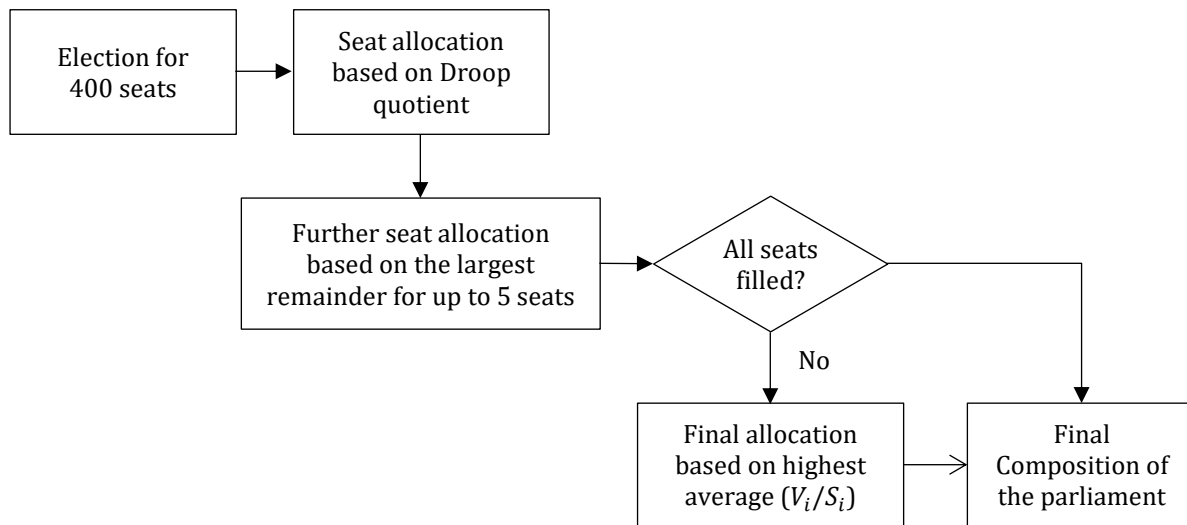
Every party is allocated as many seats as enumerable by the quotient. The amount of the vote translated into seats for each party is then deducted from its total votes.

In the second stage, as many as 5 more seats are allocated to parties with the largest remainder of the vote (i.e., their total vote – portion of their vote that is accounted for by full Droop quota).

If some seats are still left vacant after the second stage, the total national vote of each party is divided by the number of seats it has already been allocated to calculate the average votes per seat for all parties. Now parties with the highest average values are allocated a seat each until all seats are distributed (see Álvarez-Rivera (2017) for a numerical example).

When the final distribution is decided, seats of every party are allocated to the provinces based on the local popularity of the candidates on each local party list. Figure 5.4 illustrates those aspects of the South African electoral system that affect its level of disproportionality.

⁷³ Electoral Commission Act 51 of 1996, electoral act 73 of 1998 and amendment act 34 of 2003

**Figure 5.4**

The South African electoral system flowchart (electoral law: 1994)

Our simulation of South African electoral system resulted in a D_a figure of 0.116% which is the lowest among all countries examined in this research. As such, there is not much to manipulate in the structure of the system to improve its proportionality. In the South African system, the electoral formula is a combination of LRM and HAM (see appendix C). The only thing that could have been changed to arrive at zero disproportionality was to replace the electoral formula with LRM. However, as implied by this example, generally electoral systems that distribute all seats in a single nationwide district have a very high chance of achieving proportionality regardless of the electoral formula.

5.5.2 Local PR + national levelling (case study: Norway)

Electoral systems with local distribution of seats to MMDs and reserved compensatory seats at the national level to guaranty proportionality are said to have a 'levelling' component. Denmark, Sweden, Norway, and Germany use national reserved seats explicitly to achieve proportionality.⁷⁴ The logic behind this design is to adjust the disproportionality introduced when seats are initially distributed at the provincial level. This is to ensure that the final allocation of seats comply with the national distribution of votes among parties while at the same time retaining a certain level of tie between the MPs and their local constituencies missing in systems without local districting. One design consideration in compensatory systems is the ratio of the levelling seats to the overall size of the legislature. This ratio is 50% in Germany, 23% in Denmark, and 11% in Sweden and Norway. Selection of proper ratio is dependent upon other aspects of the electoral system too. So there is hardly any universal lower limit for the share of the levelling seats that can guaranty the proportionality. The Average disproportionality in this class is 5.81%.

⁷⁴ Although some other electoral systems such as MMP used in New Zealand, Lesotho and Bolivia also use national seats to achieve higher proportionality, nonetheless this logic is subdued in these cases by other design elements that prevent pure proportionality.

The Norwegian electoral system

From 1815 until 1918 a majoritarian electoral system was used in Norway which amounts to 60% of its electoral history. Switch to a semi-proportional system took place in 1920. Eventually, in 1989 a compensatory electoral design came into force (Aardal 2002) which is still in use with minor modifications. Table 5.5 summarises the history of electoral reforms in Norway

Table 5.5

Electoral systems in Norway since 1814

Electoral system	NOR-I	NOR-II	NOR-III	NOR-IV	NOR-V	NOR-VI
# Elections included	1815-1903 (31 elections)	1906-1918 (5 elections)	1921-1949 (8 elections)	1953-1985 (9 elections)	1989-2001 (4 elections)	2005- (3 elections)
Electoral formula at lower level	Indirect, plurality	Majority, runoff	PR d'Hondt	PR Modified St. Laguë	Modified St. Laguë	Modified St. Laguë
District magnitude	2.6	1	5.2	7.8	8.7	8.9
Electoral formula at higher level	NA	NA	NA	NA	PR Modified St. Laguë	PR Modified St. Laguë
Number of compensatory seats	NA	NA	NA	NA	8	19
Compensatory seats in per cent	NA	NA	NA	NA	5	11.2
Allocation of seats in multi-member constituencies final?	NA	NA	NA	NA	Yes	Yes
Legal thresholds for compensatory seats	NA	NA	NA	NA	4% of valid national vote	4% of valid national vote
Average assembly size	103.6	123.6	150	152.4	165	169

Source: Aardal 2002, 168-9; Bedock 2017, 273

The Norwegian parliament (called *Storting*) is a unicameral body composed of 169 MPs slightly below the prescribed OSL_a figure of 180 based on our calculations from the 2013 election demographic data. 150 of the seats are distributed locally in 9 multi-member districts bordered on the 9 counties of Norway. Districting (i.e. distribution of seats to electoral districts) is made in such a way that counties with a larger rural area and scattered population are slightly overrepresented in the parliament. In other words, in these counties more parliament seats are allocated per county population (Hylland 2010, 3). In Norway 19 seats are reserved for levelling: one per every electoral county. A factor that limits the efficiency of levelling is the threshold of votes needed by parties to be included in the distribution of the compensatory seats. This threshold may be set at the national or local level or a combination of both. Depending on the structure of the threshold component, sometimes a combination of the local and national thresholds can reduce the effective threshold of entitlement to the compensatory seats for parties. Denmark is one such example (Elklit et al. 2011, 7). In the Norwegian system, this threshold is set at 4% of the national vote.

The electoral formula used in Norway at both local and levelling rounds of allocation is Modified Sainte-Laguë which produces less disproportionality compared to the D'Hondt method

(Marshall et al. 2002). But, contrary to what is implied by its name, this method is worse than the Sainte-Laguë method in terms of proportionality and allowing for the smaller parties to win seats (Blais and Massicote 2002, 48) (see appendix C). Figure 5.5 depicts the Norwegian electoral system flowchart.

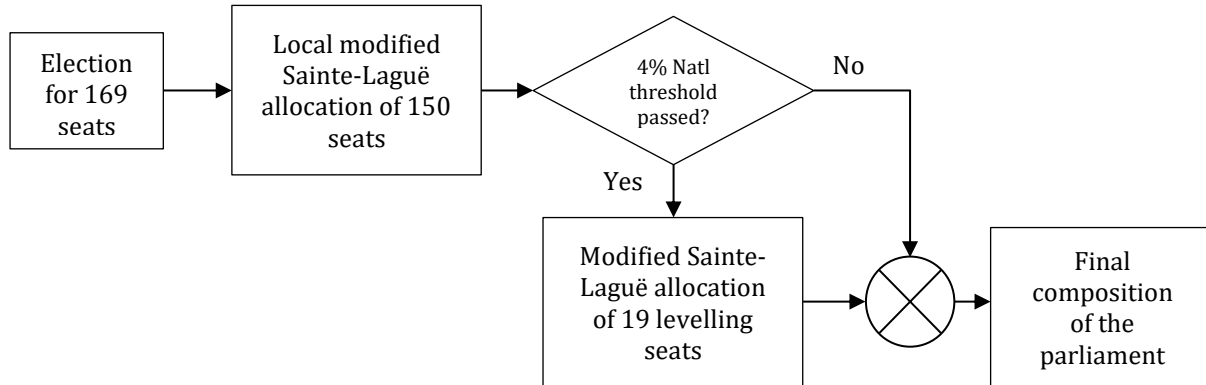


Figure 5.5
The Norwegian electoral system flowchart (electoral law: 2005)

The seat allocation procedure

In the first round, seats are distributed among all parties at the local level based on local election results using Modified Sainte-Laguë method.

In the second round, votes are aggregated at the national level. Parties that receive at least 4% of the total national vote, enter the levelling procedure. For parties that did not meet the threshold, local seats they received would be their final share. These seats are then left aside. In the levelling procedure the remaining seats are allocated between the parties present in this round based on their vote.

Hylland (2010: 5-6) explains the procedure for the allocation of the levelling seats as follows:

“Parties not reaching the threshold and lists not affiliated with parties can win district seats. The number of such seats is denoted as n .

The parties that reached the threshold shall together get $169 - n$ seats. The $169 - n$ seats are distributed among these parties according to their national votes by the Sainte-Laguë method. The number of seats thus awarded to party i is denoted as c_i .

For each party that reached the threshold, the difference $c_i - d_i$ is computed. That is, the party's number of district seats (d) is subtracted from the number of seats it was awarded when the $169 - n$ seats were proportionally distributed (c_i).

The sum of the numbers c_i is $169 - n$, and the sum of the numbers d_i is $150 - n$ with sums being taken over the parties that reached the threshold. Hence the sum of the numbers $c_i - d_i$ is always 19. If $c_i > d_i$ for all i , the distribution of the 19 compensatory seats has been determined.

It is possible, however, that a party wins more district seats than the number of seats awarded to it by proportional distribution of the $169 - n$ seats. This means that $c_i < d_i$ for some i . Since the house size is fixed at 169 and the distribution of the district seats cannot be changed, a new computation must be carried out, excluding the parties for which $c_i < d_i$ and the district seats they have won. This procedure may have to be repeated.”

Our modelling yields a D_a of 5.15% for the Norwegian electoral system (table 5.6, row 1). When the 4% threshold for access to national compensatory seats is removed, this figure drops significantly to 1.89% (table 5.6, row 6). This is the single most impactful factor behind the disproportionality in Norwegian system. The second significant impact is of the electoral formula. When the formula is changed to Hare-Niemeyer (LRM), D_a drops to 3.32% (table 5.6, row 5). As shown in table 5.6, malapportionment of the seats to districts (row 3) and less than optimal size of the Storting (row 4) contribute very little to the disproportionality in this electoral system design.

Table 5.6

The impact of electoral design components on disproportionality
Simulation results for the Norwegian electoral law used in the 2013 general election

Electoral system design	D_a (%)
1. Current electoral system	5.15
2. Levelling seats doubled to 38	5.45
3. Malapportionment in districting corrected	5.08
4. Size of the parliament increased to OSL_a (=180)	4.80
5. Hare-Niemeyer electoral formula used instead of Modified Sainte-Laguë at both local and levelling rounds	3.32
6. Threshold removed	1.89

The most interesting experiment with the Norwegian electoral system is to increase the number of levelling seats to 38 to see if this would help to reduce disproportionality. Surprisingly, this manipulation increases D_a by 0.3% to 5.45% (table 5.6, row 2). This counterintuitive outcome may be attributed to the fact that adding to the number of the levelling seats would inevitably reduce the size of the local districts when the size of the parliament is held constant. This, in turn, introduces an extra disproportionality at the first round when seats are distributed locally. Because the threshold of 4% bars smaller parties from access to the levelling mechanism, the knock on effect of lowering the size of the local districts would be to deny more seats from such minor parties. Hence, although by this manipulation more seats are available for levelling, the small size of the local districts already functions as a higher natural threshold and induces extra disproportionality. The extent of this inflation is such that it can not be offset by the positive effect of having more levelling seats. Had the extra levelling seats been added to the existing 169 seats of the Storting, we could have achieved a decrease in overall disproportionality.

5.5.3 National allocation by a Highest Average Method (case study: Montenegro)

This design is used in 8 countries (Serbia, Kosovo, Montenegro, Slovenia, Slovakia, Austria, the Netherlands, East Timor, and Fiji) with the average disproportionality of 6.43%.

Like South Africa, Montenegro is another example of distribution of all seats at the national level. However it differs in the electoral formula which is D'Hondt (a highest average method) in case of Montenegro as opposed to Hare-Niemeyer in South Africa.

The Montenegrin electoral system

Electoral politics resumed in Montenegro in 1990 after a long interregnum. Three electoral designs have taken place since which are mainly different in their treatment of the ethnic minorities. The first two elections lacked arrangements for the protection of minority representation. During the second period, a separate electoral district was allocated to the Albanian minority called the “sub-constituency”. Parties were expected to run in both constituencies and win at least 3% of the vote in both while provisions for the transfer of the waste vote⁷⁵ between the national constituency and the sub-constituency varied between elections in this period. The third era started by the 2012 general election and is marked by the abolition of the minority constituency and its replacement with a multilayered threshold system. Table 5.7 shows the evolution of the electoral system in Montenegro.

Table 5.7

Electoral System reforms in Montenegro since 1990

Electoral system	MNE-I	MNE-II	MNE-III
Years	1990-92	1996-2009	2012-
Elections included	2	6	2
Electoral formula	Closed-list PR D'Hondt	Closed-list PR D'Hondt	Closed-list PR D'Hondt
Legal thresholds (of valid votes)	4%	3%	3% 0.7% 0.35%
District magnitude (excl. minority seats)	125/85	66-76	81
“Sub-constituency” magnitude	-	4-5	-
Average assembly size	125/85	71-81	81

Data: Stojarová and Emerson 2010; OSCE reports (various years); Haukaas 2013.

According to the constitution, the Montenegrin parliament should have 1 MP per every 6000 voters which equalled 81 MPs in 2012 election. A distinct feature of the Montenegrin electoral system is its multiple thresholds of vote. This arrangement is designed to accommodate the parliamentary representation of ethnic minorities.

Montenegro is a multi-ethnic country. According to the 2011 general census⁷⁶, of the 94.94% of the population who declared their identity, 44.98% identified themselves as Montenegrin, 29.36% as Serb, 8.77% as Bosniak, 4.91% as Albanian, 3.38% as Muslim, 1.01% as Roma, and 0.97% as Croat. Some 1.56% of the population belonged to more than 10 other ethnic groups. Evidently no single ethnic group constitutes an absolute majority in Montenegro.

⁷⁵ Vote in addition to the necessary quota to win a seat. Waste vote is a fraction of the quota that does not translates to seats for a party.

⁷⁶ results accessible at: <http://www.monstat.org/eng/page.php?id=393&pageid=57>

Based on the same source, in terms of religious identity, 72.1% of the Montenegrins are Orthodox Christian, 19.1% are Muslim, 3.4% are Catholic and 1.2% have no religion. 1.5% of the population adhere to other religions.

To get a glimpse of the degree of identity fragmentation in Montenegro, we calculated the fractionalisation index as per Alesina et al. (2003).⁷⁷ This index varies between 0 and 1 with 0 indicating no fractionalisation and 1 corresponding to maximum fractionalisation among identity groups. Based on our calculations, Montenegro has an ethnic fractionalisation index of 0.70 and a religious fractionalisation of 0.42. The extent of the ethnic fractionalisation in Montenegro is remarkably high compared to other countries (see Alesina 2003, Appendix 1).

Countries with high levels of ethno-linguistic or religious heterogeneity often choose between two electoral strategies to handle their social cleavages. As noted in section 5.3.3, these two approaches are known in the jargon of political studies as bridging and bonding strategies.

The ‘bridging strategy’ focuses on creating electoral incentives to dilute identity differences by urging parties to bridge between multiple identity groups in the form of multi-ethnic and cross-ethnic parties. Indonesia and Bolivia are two examples. These systems are usually known as ‘centripetal’ (Cordell and Wolff 2011, 290).

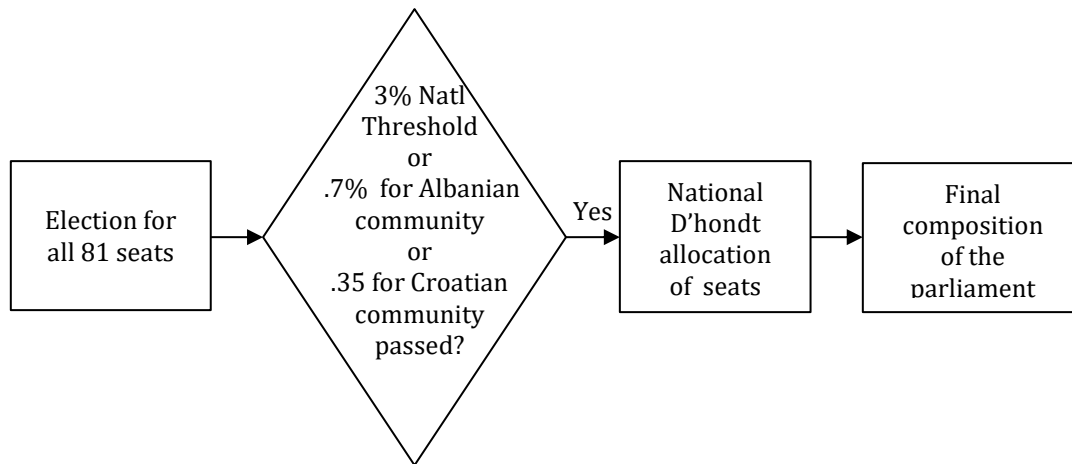
Alternately, ‘centrifugal systems’ focus on urging parties to “gain votes from a narrower home-base among particular segmented sectors of the electorate”. Such systems bond identity groups together and ensure their independent political representation at the expense of reifying the identity politics and hence are based on the ‘bonding strategy’. The Montenegrin system is an example of soft centrifugalism (Cordell & Wolff 2011, 289).

Parties can run in the election either as a normal party or as representative of one of the four main ethnic minority groups (Serbs, Bosniaks, Albanians, and Croats). Votes are cast in electoral districts but seat allocation takes place at the national level using the aggregated vote from the districts. The ethnic parties may only run in districts where their respective ethnic group constitutes at least 15% of the population based on the most recent census.

The seat allocation procedure

The seat allocation process for the Montenegrin electoral system is illustrated in figure 5.6. To avoid visual complications, many details of the threshold structure are not included in the diagram.

⁷⁷ They use the following formula for calculation of fractionalisation: $Frac = \sum_{i=1}^N s_i^2$
Where s_i is the share of group i $i \in \{1, 2, \dots, N\}$ from total population

**Figure 5.6**

The Montenegrin electoral system flowchart (electoral law: 2011)

After the vote is aggregated at the national level, parties have to go through the threshold tests. Structure of thresholds in the Montenegrin system is rather complicated compared to many other countries with electoral thresholds. There is a general 3% threshold (of the valid votes) in effect for all parties except for those representing one of the ethnic minorities.

For every specific ethnic minority, if at least one of its nominated parties passes the electoral threshold other parties of that minority below the 3% threshold are denied seats in the parliament. This is almost always the case with the Serbian parties because it is highly unlikely that one of these parties would not win 3% of the vote given that Serbs comprise almost 30% of the population.

For every minority if none of the parties representing that minority passes the 3% threshold, those parties with at least 0.7% of the valid vote can combine their votes and participate in the seat allocation as a collective. The number of seats allocated to such collectives should not exceed 3. Seats gained in this way will then be split among these parties upon their discretion.

The small community of Croats has the privilege of gaining 1 seat if one of their parties passes a 0.35% threshold of the valid vote. This last provision may be interpreted as a quota whenever the Croat voters join force behind one party (‘‘IPU PARLINE Database: MONTENEGRO (Skupstina), Electoral System’’ 2017; Haukaas 2013; OSCE/ODIHR 2012).

The combined effect of these thresholds is the selective waiver of the 3% threshold for some parties representing the smaller minorities (Bosniaks, Albanians, and Croats) while denying access to some Serb (and potentially Bosniak) parties with sizable vote because these two communities usually have at least one party capable of winning more than 3% of the total valid votes. In other words, this structure serves the purpose of minimizing fragmentation in the vote of the Serbian, Bosniak, and Croat communities.

The electoral law used in the 2012 general elections, was enacted in the legal reforms of 2011. Prior to these reforms, five seats were reserved for the ethnic Albanians. Albanians had their own designated unitary constituency and if they wished they could have chosen to vote in this constituency. This constituency had its independent threshold of 3% (OSCE/ODIHR 2006;

OSCE/ODIHR 2009). Table 5.8 presents the simulation results for the effect of various aspects of the Montenegrin electoral system on its proportionality.

Table 5.8

The impact of electoral design components on disproportionality
Simulation results for the Montenegrin electoral law used in the 2012 general election

Electoral system design	D_a (%)
1. Current electoral system	4.22
2. Hare-Niemeyer electoral formula instead of D'Hondt	3.56
3. Size of parliament increased to OSL_a (92)	3.31
4. Minority thresholds removed	4.96
5. Majority threshold removed	3.19
6. Majority and minority thresholds removed	2.78
7. Majority and minority thresholds removed, Hare-Niemeyer electoral formula implemented	1.90

The single most influential component of the electoral design on the disproportionality of the results is the threshold-quota structure which causes disproportionality to rise from 2.78% (table 5.8, row 1) in the scenario of no thresholds (table 5.8, row 6) to 4.22%. Interestingly, the overall effect of the minority quota-threshold structure on disproportionality is negative (table 5.8, row 4 compared to row 1) meaning that when this structure is in place, more parties are able to bypass the national threshold or in other words more seats are distributed proportionately which decreases disproportionality.

The residual 2.78% disproportionality after removing the threshold-quota structure (table 5.8, row 6) is the combined effect of the small size of the legislature and its HAM electoral formula. Rows 2 and 3 of table 5.8 show the effect of each of these two design elements on disproportionality in the presence of other design components. Based on the results, so long as the disproportionality of the threshold-quota structure is not offset, improvement in proportionality is minute when the legislature size or the seat allocation mechanism are modified.

5.6 The electoral disproportionality of semi-proportional systems

Semi-proportional systems are primarily characterised by allocation of the seats in local multi-member districts. Some semi-proportional systems have a national distribution module too. However, this national district only functions in parallel to the local distribution and is not intended at fixing its disproportionality. 10 countries in this study use local distribution with LRM electoral formula while 26 more use local distribution with a HAM electoral formula. Two other classes of the electoral systems that may be classified as semi-proportional are mixed member proportional (MMP) and majority bonus system (MBS). Depending on their design, some MMP systems may be classified as proportional. Also, the MBS systems may resemble the majoritarian systems in certain respects so both of these classes are in a way on the periphery of the semi-proportional family. Average disproportionality in this family is 10.94%.

5.6.1 Local allocation by LRM (case study: Sri Lanka)

10 countries in our study fall in this class of systems. These include: Cyprus, Morocco, Guyana, Nicaragua, El Salvador, Honduras, Colombia, Benin, Sri Lanka, and Indonesia. Some variation is observable among the electoral systems in this class. In half of the cases (Sri Lanka, Guyana, Nicaragua ("Nicaragua 2011 - Final Report on the General Elections and Parlacen Elections" 2011), and Morocco) a portion of the parliament seats are reserved to be allocated based on the aggregate results at the national level. Although, these national seats are not designed to compensate for the initial disproportionality caused by the local allocation of the seats (i.e. this is not a levelling mechanism), our analysis shows that sometimes the existence of a nationwide district is capable of mitigating disproportionality.

In Sri Lanka, Indonesia, Morocco, and Cyprus, local or national thresholds are in place for parties to be eligible to participate in seat allocation. Other countries in this class have no electoral threshold. Average disproportionality produced in this group is 7.99%. In this section, the electoral system used for the Sri Lankan general election of 2015 and its constituting elements will be introduced as an example of this group of electoral systems.

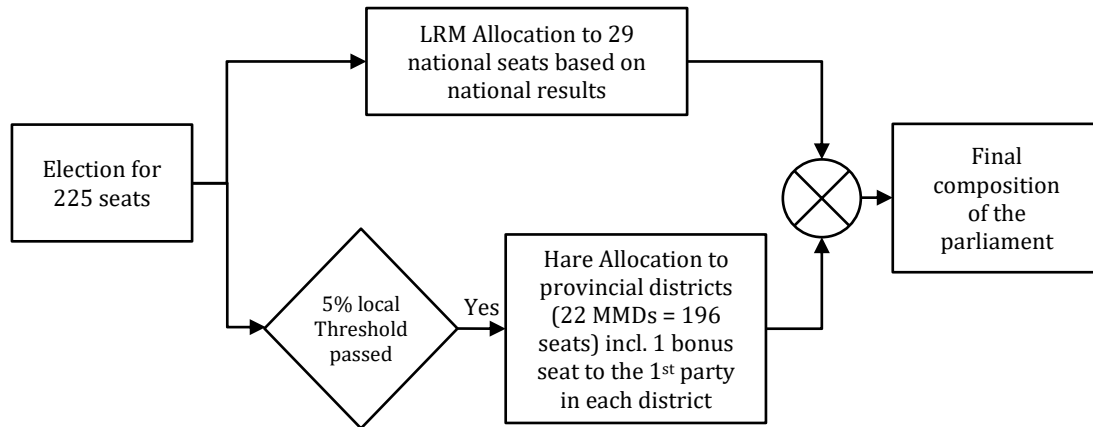
The Sri Lankan electoral system

The Sri Lankan Parliament has 225 seats of which 196 are distributed to 22 provincial electoral districts. These districts vary in size from 4 to 19 seats and are bordered on the administrative divisions of the country. Apportionment of the seats to provinces is adjusted by the electoral commission before every election to correspond with their size of the voting-eligible population.

After independence from Britain in 1948, Sri Lanka initially adopted a single member district plurality electoral system resulting in a two-party system. Gradually though, discontent built up around three issues: severe disproportionality of outcomes, high seat volatility among the largest parties (i.e. small change in vote share would result in large change in the seat share of the parties from one election to the next), and under-representation of third parties. This third issue was especially important in the light of mounting resentment on the part of the minority Tamil community who could find little opportunity for political representation and was hence seeking the path of autonomy or independence. Curbing these issues was the motive behind switching to the proportional system in the 1978 constitution which is still in use today (Allen Hicken 2004, 462-3).

The seat allocation procedure

Seats in the provincial districts are allocated based on the provincial results of the election using the Hare-Niemeyer electoral formula. Parties must win at least 5% of the district vote to be eligible for the district level seat allocation. In every provincial district, first, the leading party receives 1 seat as bonus. That seat is then left aside and the rest of the provincial seats are distributed among all parties based on their provincial votes. The remaining 29 seats are distributed by the largest remainder method to all parties based on their total national vote (Parliament of Sri Lanka website 2017). Figure 5.7 illustrates the seat allocation procedure in the Sri Lankan electoral system.

**Figure 5.7**

The Sri Lankan electoral system flowchart (electoral law: 1978)

Table 5.9 presents the simulation results for the most recent Sri Lankan election.

Table 5.9

The impact of electoral design components on disproportionality
Simulation results for the Sri Lankan electoral law used in the 2015 general election

Electoral system design	D_a (%)
1. Current electoral system	7.97
2. No districting	8.61
3. Size of parliament increased to OSL_a (292)	7.14
4. Size of parliament increased to OSL_a (292), malapportionment of seats to districts corrected	7.58
5. Bonus seats removed	6.05
6. Local threshold removed	4.95
7. No districting, No threshold	0.87

As the simulation results show, in the Sri Lankan electoral system about 8% of the seats end up in the wrong hands so far as proportionality is concerned (table 5.9 row 1). Change in the size of the parliament to OSL_a or adjusting for the malapportionment of the seats to provinces does not significantly reduce disproportionality. However, interestingly when both measures are taken at the same time (table 5.9 row 4) reduction in disproportionality is less than when only the size of the legislature is increased to OSL_a (Table 5.9 row 3). The explanation for this is again the change in the magnitudes of the provincial districts. The three distributions of seats to districts are shown below:

$$dm_{current} = \{7,9,8,5,19,10,18,7,7,10,12,9,15,5,8,5,8,5,8,11,4,6\}, \quad S = 225$$

$$dm_{OSLa} = \{9,12,10,6,25,13,23,9,9,13,16,12,19,7,10,7,10,7,10,14,5,8\}, \quad S = 292$$

$$dm_{OSLa \text{ without malapportionment}} = \{8,11,11,6,27,14,28,8,9,15,18,11,21,6,11,6,9,5,9,13,4,4\}, \quad S = 292$$

It can be seen that in the third distribution, districts of small size are more frequent than in the second distribution. Once more, as in the case of Norway, since district magnitude imposes a natural threshold to the seat allocation at the district level, the third seat distribution pattern produces more disproportionality even though it is closer to the notion of one person one vote.

Removing the national electoral threshold would reduce disproportionality by 3% (table 5.9 row 6). It can be seen that unlike the proportional systems explained in section 5.5, the effect of removing the threshold is more limited here due to the local nature of the vote-seat allocation. When the local districting (and subsequently the provincial threshold of 5%) is removed, disproportionality drops to mere 0.87% (table 5.9 row 7). The residual disproportionality is the consequence of the small size of the legislature.

5.6.2 Mixed-member proportional system (case study: New Zealand)

New Zealand, Germany, Lesotho, and Bolivia are the four countries currently using MMP for their legislative elections. The average disproportionality in this class is 8.73%.

How Mixed-Member Proportional system (MMP) works?

Under the MMP, a portion of the seats are reserved to be allocated nationally (adjustment seats) and the rest are up for competition in local single member districts. The logic of reserved national seats is to achieve maximum overall proportionality. However, success of this design largely depends on dealing with the problem of overhang seats. This issue will be discussed shortly. Bolivia exhibits variation in this design because in the Bolivian system compensatory seats are not allocated at the national level but rather at the level of the departments. Each electoral department is comprised of several SMDs and is bordered on the administrative boundaries of the administrative departments. Apparently, such design further limits the overall achievable proportionality of the system.

Under the MMP, voters cast two votes: one for a candidate at their single member electorate (electorate vote) and another for a party (party vote). The electorate vote is used for first-past-the-post election of candidates in the local electorates and the party vote determines the fate of all parliament seats based on the principle of proportionality. The adjustment seats are used to complement the electorate seats to achieve the intended proportional distribution.

The overhang seats

The above description may remind one of the compensatory systems that were explained in section 5.5.2. In fact, these two classes may overlap if certain conditions are met. These conditions have to do with the treatment of what is known as the 'overhang' issue in the MMP systems.

As explained above, in the MMP systems allocation is first made to SMDs based on the electorate vote. Due to the possibility of strategic voting, there is no guaranty that voters cast their electorate and party votes for the same party. So, if a party wins more district seats than its proportional share of the total seats based on the party votes, then the issue of overhang seats arises. Overhang seats are the total number of seats each party wins in the electorates minus the

number of seats it is entitled to based on its party vote when this number is positive. This problem can potentially result in a deviation from proportionality depending on how different electoral systems treat it. In Bolivia and Lesotho, where the size of parliament is fixed, overhang seats are awarded to the parties that have won them and the remaining seats are distributed among the other parties based on their share of the party votes. This no-treatment scenario makes the results considerably disproportional (Olowu & Chanie 2016).

In New Zealand (and in Germany until 2013), the overhang seats are awarded but no seats are deducted from the national seat share of other parties. As a result, the size of the parliament is not fixed and increases in each election by the total number of overhang seats. While causing less disproportionality than the design used in Bolivia and Lesotho, still this design does not guaranty full proportionality because some parties get more seats than their share of the party votes.

The best solution for the overhang seats problem is the system that has been put to use in elections to the German Bundestag since 2013.⁷⁸ Under the German system, the overhang seats are awarded to the respective parties but the seat shares of the other parties are increased in such proportions that full proportionality can be achieved. At times, this can imply a considerable increase in the size of the parliament. For example, size of the Bundestag was inflated by 33 seats (from 598 to 631) following the federal election of 2013 to achieve proportionality.

The New Zealand electoral system

A purely majoritarian system was in use in New Zealand until 1993. Disenchantment from the politicians along with highly disproportional outcomes in a period of party system disarray eventually led to switch to MMP in a referendum in 1993. Beginning in 1996, the new system has been used in 8 national elections so far.

Under the MMP, New Zealand is divided between 71 single member districts. Of these, 64 districts partition the whole territory of New Zealand. Seats in these districts are available to all voters in each district. The other 7 districts again partition the entire territory of New Zealand but they are accessible only to people of Māori descent. These voters may choose to vote only in one type of the districts. 50 seats are reserved for the adjustment purpose at the national level (Miller 2005).

The seat allocation procedure

After each election, first, winners of the electorates are decided by simple majority based on the electorate votes of the voters.

⁷⁸ Technically, an equally advantageous solution would be to take the overhang seats away from those parties that have more electorate seats than they deserve. But then the question would be which electorates to lose their local representative. This alternative has attracted no interest in the design of national electoral systems so far.

Second, all seats are distributed using the Sainte-Laguë method at the national level based on the party votes to the parties that have gained at least 5% of the total party votes or at least 1 electorate seat.

After the party seat shares are determined, for parties whose electorate seats are more than what they are entitled to based on their party vote share, the difference is added to the total seats of the respective parties and the size of the legislature is increased by the same number. This would finalise the distribution of seats (Miller 2005). Figure 5.8 outlines the electoral system of New Zealand.

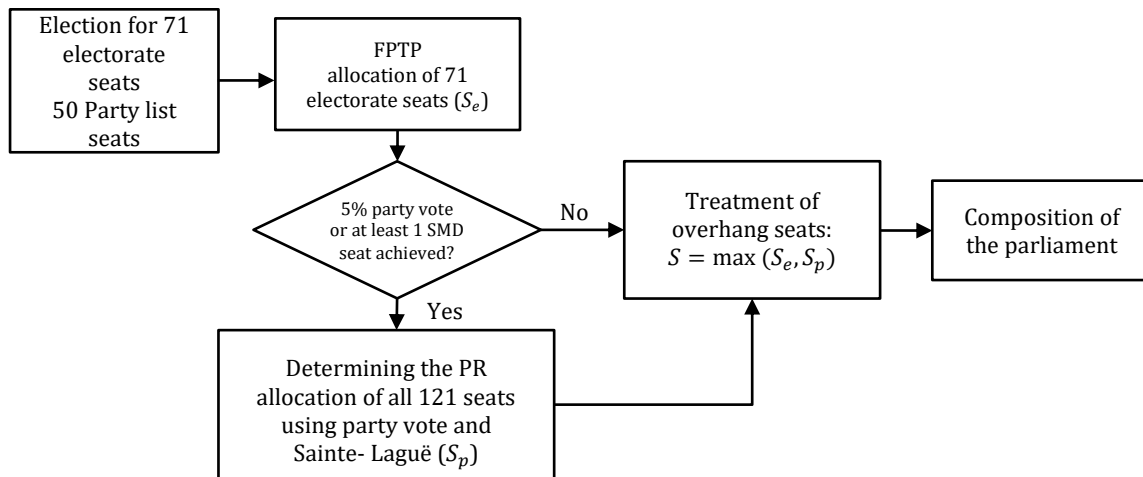


Figure 5.8

New Zealand's electoral system flowchart (electoral law: 1996)

Strategic voting

In section 4.2.4.5, we discussed the effect of strategic voting on disproportionality in the MMP systems where the problem of overhang seats is not fully treated. We hypothesised that strategic voting should increase the manifest disproportionality. In this section we are going to test this hypothesis. First, it must be noted that in the context of the MMP systems, when we talk about strategic voting, we mean specific types of strategic voting that arise when voters choose to vote for two different parties on their two ballot papers. By this assumption, we exclude other forms of strategic voting that may be observed in electoral systems (including in MMP) from this enquiry. Moser and Scheiner (2009) have shown that ticket splitting may be commonly found in established democracies, whereas in younger democracies with poorly institutionalised party systems, strategic voting is less prevalent.

In chapter 4, we explained two types of strategic voting that may be found in New Zealand's MMP:

Type 1: occurs when in an electorate a fraction of voters, who cast their party vote for their preferred party, choose to cast their electorate vote for another party because they assess the chance of their preferred party to win a majority in that electorate to be slim. These voters make this concession to a party that: a) is ideologically close to their preferred party, and b) has a realistic chance of winning a plurality of the votes in the electorate (i.e. one of the two leading

parties in the electorate). Voters' motivation for this type of strategic voting is to avoid vote waste common to all majoritarian electoral systems. In practice, this kind of behavioural adjustment in the majoritarian systems partially conceals the inherent disproportionality of the electoral system because the notion of waste vote that voters seek to minimise is in fact the major source of disproportionality in electoral systems. However, we expect that under the MMP this type of strategic voting would cause more disproportionality because it also increases the likelihood and frequency of overhang seats which is not corrected for under the New Zealand MMP.

To include type 1 strategic voting in our simulation model, we had to make a few assumptions. These assumptions are:

1. 9 parties win more than 1% of the vote with party 1 being the most popular party.
2. Parties 1 and 4 are on the same ideological side of the politics (camp 1) and 50% of their supporters are willing to switch their electorate vote to either party that is more likely to win an electorate seat.
3. Parties 2, 3 and 5 are on the opposite ideological side of the politics (camp 2) and 50% of their supporters are willing to switch their electorate vote to any of these 3 parties that is more likely to win an electorate seat.
4. Prior to the elections, party officials in every electorate have an estimation of the likely pattern of distribution of votes among the contesting parties (Moser & Scheiner 2009) and they can communicate this knowledge with the respective party voters prior to the elections.

Type 2: may be observed when in an electorate the party with a strong lead, encourages its supporters to cast their electorate vote for a minor party (a potential coalition partner) which otherwise would have no chance of winning the electorate.⁷⁹ The result would be to allow a party to pass the electoral threshold (of at least 1 electorate seat or 5% of the party vote) to enter the parliament. If such a party have a considerable party vote (but below 5%) it can potentially win up to 6 seats in the legislature by winning one SMD seat ($121 \text{ seats} * 5\% \simeq 6 \text{ seats}$). The 'United Future' and 'ACT' parties have benefited from National party's favour in this way a few times since switch to the MMP in 1993.

To model the type 2 strategic voting for New Zealand the following scenario is assumed:

1. In every election 1 or 2 parties win 1 electorate seat by receiving type 2 strategic votes.
2. Parties that receive type 2 strategic votes are among the three least popular parties.

These assumptions are made based on a careful observation of New Zealand's past elections and the pattern and frequency of the type 2 strategic voting.

Type 3: A third type of strategic voting unique to the MMP may arise when a party with a geographically concentrated base of vote asks its supporters to cast their electorate vote for the party but their party vote for another major party to increase the seat share of their potential ally in the parliament. This tactic is useful when the former party knows that it would not get more seats from its maximum mobilizable party vote than the number of electorates it can win.

⁷⁹ Although this practice would payoff under the German electoral system until 2013, no instances of successful change in the results by type 2 tactical voting is recorded.

The ‘Maāri party’ is a case in point in New Zealand. This party has a lead in Maāri electorates and occasionally encourages its supporters to cast their party vote for the Labour party. The type 3 strategic voting is again a direct outcome of lacking a proper adjustment mechanism for overhang seats. Many parties can occasionally adopt this calculus regardless of their overall level of popularity but with slightly different considerations. This can be subject of an independent investigation and we do not intend to delve any deeper into when and how this rather complicated phenomenon happens.

Table 5.10 presents the contribution of structural and behavioural factors to the total disproportionality of the New Zealand’s electoral system based on our simulations. It should be noted that our simulations are independent of the assumption that all 9 parliamentary parties run candidates in all SMDs. In reality it is common for smaller parties not to contest in all SMDs due to the excessive costs involved and small chance of winning seats (Cox and Schoppa 2002 have discussed this issue at length). Yet the question of whether smaller parties offer candidates in all SMDs or not does not influence our simulations because ultimately disproportionality is measured using the party vote for the voters and not their electorate vote and even when their preferred party is absent from the local ballot, voters still strategically opt for another party that they find closer to their own ideology.

Table 5.10

The impact of electoral design components on disproportionality
Simulation results for New Zealand electoral law used in the 2014 general election

Electoral system design	D_a (%)
1. Current electoral system	6.25
2. Hare-Niemeyer electoral formula implemented	6.25
3. Size of parliament increased to OSL_a (171)	5.96
4. No strategic voting	9.32
5. Only type 1 strategic voting	9.59
6. Only type 2 strategic voting	6.21
7. Threshold removed	1.45
8. Threshold removed, no strategic voting	1.76
9. Threshold removed, only type 1 strategic voting	1.44
10. Threshold removed, only type 2 strategic voting	1.75

Table 5.10 suggests that electoral threshold is the single most influential cause of disproportionality in the electoral system of New Zealand. Removing the threshold would reduce the disproportionality by 4.8% (table 5.10, row 7). Further, changing the electoral formula from Sainte-Laguë to Hare-Niemeyer or increasing the size of the parliament to OSL_a does not improve proportionality significantly (table 5.10, rows 2 and 3 compared to row 1).

Regarding our hypothesis that strategic voting should increase disproportionality in New Zealand’s MMP, it is not supported by simulation results. Rows 4 to 10 in table 5.10 reveal that the type 1 strategic voting has no meaningful impact on disproportionality while the type 2 strategic voting even mitigates the impact of the threshold by around 30 percent. When there is

no strategic voting, D_a is 9.32% (table 5.10, row 4). When the type 2 strategic voting is simulated in the model, the D_a drops by 3.11% to 6.21% (table 5.10, row 6).

This outcome is resulted by two contrasting effects of the type 2 strategic voting: on the one hand, it acts as a counter balance to electoral threshold making it selectively possible for certain parties to bypass the threshold (as in the case of ethnic thresholds in sections 5.3.3). This may be interpreted as a lower effective threshold for the electoral system and acts to mitigate the disproportionality.

On the other hand, the type 2 strategic voting can allow parties with negligible vote even of a fraction of a percent to enter the parliament. These parties are otherwise unable to cross the hypothesised 1% minimum threshold for the first 9 parties. When, due to type 2 strategic voting, these parties enter the parliament and parties with larger vote share (but below 5%) fail to do so, we are witness to increase in disproportionality. Our simulation shows clearly that the latter effect is subdued by the former. Therefore, type 2 strategic voting generally reduces disproportionality.

With the role of the strategic voting in concealing disproportionality being revealed in New Zealand's MMP, we report the D_a figure for New Zealand as 9.32% to control for the effect of behavioural adjustments.

5.6.3 Local allocation by highest average methods (case study: Iceland)

This class consists of 26 countries and is the largest in our sample. Countries in this group include: Croatia, Belgium, Albania, Spain, Macedonia, Turkey, Czech Republic, Poland, Mozambique, Luxembourg, Portugal, Finland, Suriname, Costa Rica, Peru, Paraguay, Uruguay, Chile, Niger, Cape Verde, Togo, Guatemala, Iceland, Ecuador, Brazil, and Latvia. The average disproportionality of this class is 12.26%.

There is not much variety in the system design within this class of electoral systems. A majority of seats (or otherwise all of them) are distributed at the level of local multi-member districts. Only in three countries (Guatemala, Ecuador, and Iceland) a small portion of the seats are distributed nationally in parallel to the local seat distribution. In Iceland, these seats play a compensatory role; however, since the corrective mechanism is not very effective, Iceland may not be placed among the other Scandinavian systems introduced in section 5.5.2. In all but one case (Latvia) in this class, the local electoral formula is D'Hondt. Latvia uses Sainte-Laguë formula for seat allocation.

Setting a threshold of entry in these systems is not very common. However, threshold exists in 10 cases in this class. For example, Croatia, Macedonia, Albania, Belgium, and Spain apply thresholds of 2-5% at the local level for the local seat allocation. Czech Republic, Poland, and Mozambique have national thresholds of 5% for the allocation at local level. The national thresholds are more restrictive than local thresholds because parties are more likely to pass the local threshold in at least some of the local districts than in the entire country. So in the case of a threshold applied at the district level, small parties can win at least some seats in some local MMDs but if surpassing a national threshold is the prerequisite for receiving seats at the local level, then such parties are unlikely to win any seat.

In this class, Turkey uses double threshold at both local and national levels which combined with its high figure of 10% for the national threshold, makes Turkey one of the most restrictive

non-majoritarian electoral systems (along with Kyrgyzstan) and results in 29% disproportionality.

The Icelandic electoral system

In this section, we will focus on Iceland and its peculiar vote count process for the compensatory seats. The Icelandic parliament (locally known as Althingi) was established in 1844 when Iceland was still under the Danish rule. In the first century since its establishment, Althingi abolished what was left of the sovereign's domination over the legislature and mastered a gradual shift away from majoritarianism and small electoral districts. The reform was not completed until 1959. As an important stage in this process, the compensatory mechanism was introduced in 1934; a decade before the formal independence of Iceland from Denmark. Tables 5.11 and 5.12 summarise the evolution of some aspects of the Icelandic electoral system since the establishment of the Althingi.

Table 5.11
Evolution of the electoral system in Iceland 1844-2017

Electoral system	ICE-1	ICE-2	ICE-3	ICE-4	ICE-5	ICE-6
Elections included	1844-52 (2)	1858-69 (3)	1874-1903 (8)	1908-14 (3)	1916-19 (2)	1923-33 (4)
Electoral formula at lower level (SMDs)	MNTV ¹	qualified FPTP in 3RS ²	qualified FPTP in 3RS ²	FPTP	FPTP	FPTP
Electoral formula at lower level (DMDs)	-	-	qualified MNTV in 3RS ²	MNTV	MNTV	MNTV
Electoral formula at lower level (MMDs)	-	-	-		D'Hondt	D'Hondt
District magnitude	1	1	1.4	1.4	1.4	1.4
"Extra" members	6 Royal members	6 Royal members	6 Royal members	6 Royal members	-	-
Assembly size	26	27	36	40	40	42

Table 5.11 (Continued)

Electoral system	ICE-7	ICE-8	ICE-9	ICE-10	ICE-11
Elections included	1934-42 (3)	1942-59 (6)	1959-83 (8)	1987-99 (4)	2003- (6)
Electoral formula at lower level (SMDs)	FPTP	FPTP	-	-	-
Electoral formula at lower level (DMDs)	MNTV	D'Hondt	-	-	-
Electoral formula at lower level (MMDs)	D'Hondt	D'Hondt	D'Hondt	Hare-Niemeyer	D'Hondt
District magnitude	49	52	60	63	63
Electoral formula at higher level	D'Hondt	D'Hondt	D'Hondt	D'Hondt	modified D'Hondt
supplementary seats	11	11	11	13	9
Supplementary seats (%)	22 %	21 %	18 %	21 %	14 %
Legal threshold for supplementary round	-	-	-	-	5 %
Effective threshold for supplementary round (1 seat at local level)	11.3 %	8.7 %	5.9 %	5 %	-
Assembly size	49	52	60	63	63

¹ Each voter votes for 2 candidates. The person obtaining most votes gets elected, the person coming second becomes a deputy member

² Three-round system

Sources: Hardarson 2002; Lijphart and Aitkin 1994, 38; Helgason 2013

The seat allocation procedure

The current electoral system has been in place since the constitutional reform of 1999 (Helgason 2013, 13). Figure 5.9 depicts the structure of the Icelandic electoral system.

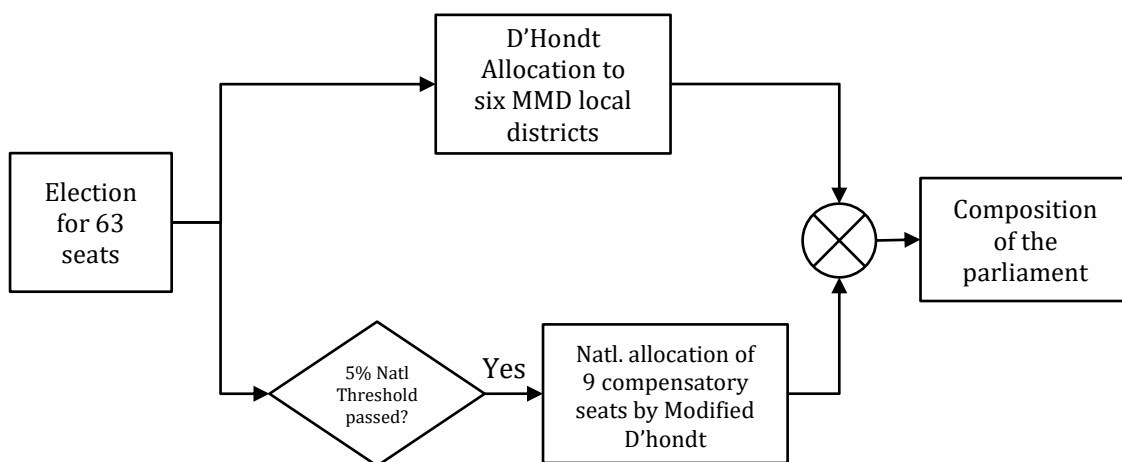


Figure 5.9
The Icelandic electoral system flowchart (electoral law: 1999)

In Iceland, 63 seats are up for contest in the elections. 54 of these seats are allocated locally in 6 districts. Magnitudes of the districts are determined based on demographic surveys prior to every election. This districting is intended at balancing the political influence of remote regions of the country and is an apparent case of malapportionment because the size of the voting eligible population varies by 82% between the smallest and the largest districts. Due to heavy concentration of population in and around the capital city Reykjavik and continued migration from provinces to this area, the malapportionment of seats to districts has always been a subject of controversy in Iceland (Hardarson 2002). The local electoral formula is D'Hondt and no threshold exists at the local level; however, the small size of the districts functions as a natural barrier to the smaller parties.

To counter the disproportionality caused by the small size of the districts and also the big-party bias of the D'Hondt formula,⁸⁰ 9 compensatory seats are reserved to be allocated nationally. To be eligible for the compensatory round of distribution, parties need to win at least 5% of the valid national vote. Compensatory seats are allocated using a locally customised variant of the D'Hondt formula whereby the allocation table (see appendix C) is filled by the following quotient:

$$K_{i,j} = \frac{V_i}{(S_i + j)} \quad (5.15)$$

V_i and S_i respectively indicate the total national vote of party i and its total allocated seats in the local districts and j is the column index in the table. The $(S_i + j)$ divisors are called 'national ranking numbers' (Helgason 2013, 13). An example can better illustrate the seat allocation procedure. Table 5.12 is the allocation table for compensatory the seats in an election with 4 parties contesting.

Table 5.12

An illustration of electoral formula used at the national level in Icelandic electoral system

Party	National vote	Total local seats allocated	$\frac{V_i}{S_i + 1}$	$\frac{V_i}{S_i + 2}$	$\frac{V_i}{S_i + 3}$	$\frac{V_i}{S_i + 4}$	$\frac{V_i}{S_i + 5}$	$\frac{V_i}{S_i + 6}$
A	10000	8	1111	1000	909	833	796	714
B	22374	13	<u>1598</u>	1492	1398	1316	1243	1178
C	28524	15	<u>1783</u>	<u>1678</u>	<u>1585</u>	1501	1426	1358
D	33547	16	<u>1973</u>	<u>1864</u>	<u>1766</u>	<u>1677</u>	<u>1597</u>	1525

The compensatory seats go to the parties that are associated with the nine largest numbers in table 5.12 (1 seat for party B, 3 seats for party C and 5 seats for party D as underlined in the table). Use of this system has the merit of avoiding overhung seats because the results of the initial local distribution of the seats from the first stage is transferred to the second stage as an input before deciding the allocation of the compensatory seats.

Table 5.13 reports the simulation results for the Icelandic electoral system. Various components of the system are manipulated to show their individual impact on the overall disproportionality of the electoral system.

⁸⁰ All Highest Average formulas favour larger parties over the smaller ones in allocation of the seats. But D'Hondt is the most extreme of such formulas.

Table 5.13

The impact of electoral design components on disproportionality
Simulation results for the Icelandic electoral law used in the 2013 general election

Electoral system design	D_a (%)
1. Current electoral system	8.67
2. Hare-Niemeyer used to allocate compensatory seats	12.23
3. Compensatory seats removed	11.85
4. Malapportionment corrected	8.64
5. Size of parliament increased to $OSL_a (=70)$	7.75
6. Hare-Niemeyer implemented at the local level	5.21
7. Threshold removed	4.88
8. Hare-Niemeyer implemented at the local level, threshold removed	3.69

Overall, the Icelandic system produces an average of 8.67% disproportionality. The main barriers against achieving full proportionality in this system are:

1. Seat allocation at the local level
2. Use of a highest average method in the allocation of the local seats
3. Electoral threshold
4. Ineffective compensatory mechanism

As in the previous cases, the 5% national threshold on eligibility for receiving the compensatory seats is the biggest hurdle against achieving proportionality. If there was no national compensation, the total disproportionality of the system would stand at 11.85% (table 5.13, row 3) which is close to the average disproportionality in this class. However, the compensation mechanism brings this disproportionality down by about 5% to 8.67%. If the Hare-Niemeyer method would have been used for local allocation, disproportionality could be decreased to 5.21% (table 5.13, row 6). Instead, if there was no threshold of eligibility for access to the national compensation, disproportionality would drop to 4.88% (table 5.13, row 7). If both components were removed simultaneously, the system could achieve 3.69% disproportionality (table 5.13, row 8).

A large part of this residual disproportionality is due to the less than optimal functioning of the compensatory mechanism's custom electoral formula. One interesting inference from the simulation is that change of the electoral formula for the compensatory seats to Hare-Niemeyer would drastically increase disproportionality rather than decreasing it (table 5.13, row 2).

Another factor contributing to disproportionality is the small size of the legislature. If corrected for, it can reduce disproportionality by 1% to 7.75% (table 5.13, row 5). Finally, the malapportionment of the seats to local districts has no impact on disproportionality based on the simulation results which is another surprising finding in the case of Iceland (table 5.13, row 4).

5.6.4 Majority Bonus System (case study: Italy 2013 & 2017)

The majority bonus system is a very special and tiny subset of semi-proportional electoral systems used only in Italy and Greece. Both countries have electoral systems that owe a large portion of their high disproportionality to a mechanism called *the majority bonus*. This mechanism is intended to allow for a functional government in a highly fragmented partisan landscape. Both countries have been traditionally faced with the problem of unstable governments and fragility of the ruling coalitions due to a large number of parties being present in the parliament while neither one (or two or three) decisively presides over the party system. To counter this problem, these two countries augmented their electoral system with a majority bonus component to inflate the size of the leading party's parliamentary caucus. This way, the leading party would be able to form a government without having to enter into a coalition with the minor parties.

In Italy, where the size of the parliament is 630, this undemocratic measure comes in the form of awarding 340 seats to any party (or pre-election coalition) that manages to win at least 40% of the national vote (parliamentary majority needed to form government in Italy is 309). The designation of 340 seats to the winning party/coalition is a guaranty for durable majority in case of likely defections from the party. In Greece, where the parliamentary majority needed for forming a government is 145 seats, the leading party in the election received 50 extra seats. In reality, both systems are more complicated and have a lot more details which are beyond the scope of this research.

The Italian electoral system

Since transition to democracy in 1946, Italy experienced several instances of electoral reforms. Between the end of WWII and 1994, a purely proportional electoral system was in place. This period was marked by extensive volatility in the party system, fragmented parliaments and fragile governments that changed hand 50 times in the course of 48 years (Marini 2017). Political instability was the pretext for the electoral reforms of 1993 that gave rise to a parallel system with a strong majoritarian component. The new system was intended at fostering a bipolar party system and to ensure the stability of the government (Baraggia 2017, 3). This electoral system was used in the elections of 1994, 1996 and 2001. Despite failing to reduce the fragmentation of the party system, the new system succeeded to some extent in encouraging pre-election electoral pacts between parties (D'Alimonte 2001, 323 and 346). The law was again amended in 2005 to take a form very similar to its current shape. The electoral system of 2005 that came to be known as *Porcellum*, introduced the concept of majority bonus and a threshold of 4% for entry to the parliament. Finally, minor changes were made to the system in 2015 by which 1) the threshold was reduced to 3%, 2) winning bonus seats was conditioned on the first party gaining at least 40% of the valid votes. If no party passes this threshold, then a runoff election between the leading two parties should determine the one that should receive the bonus, 3) majority bonus is to be allocated to the largest party while in the 2005 law it could go to the largest coalition as well, and 4) open-list voting replaced the closed-list. The electoral system that emerged from this reform is called the *Italicum* (Pasquino 2015, 297-8).

In January 2017, the Constitutional Court of Italy ruled against the proposed runoff arrangement as being unconstitutional. Therefore, the majority bonus will be awarded only if a

party wins at least 40% of the vote. Given that this scenario is very unlikely, it is feared that the Italian political system will be descended into the kind of disarray that it experienced before 1994 (Martini 2017).

The seat allocation procedure

Figure 5.10 shows the procedure for seat allocation to the chamber of deputies in Italy based on the 2017 electoral law. The provision for the second round that was abolished from the *Italicum* in 2017 is shown in stippled line.

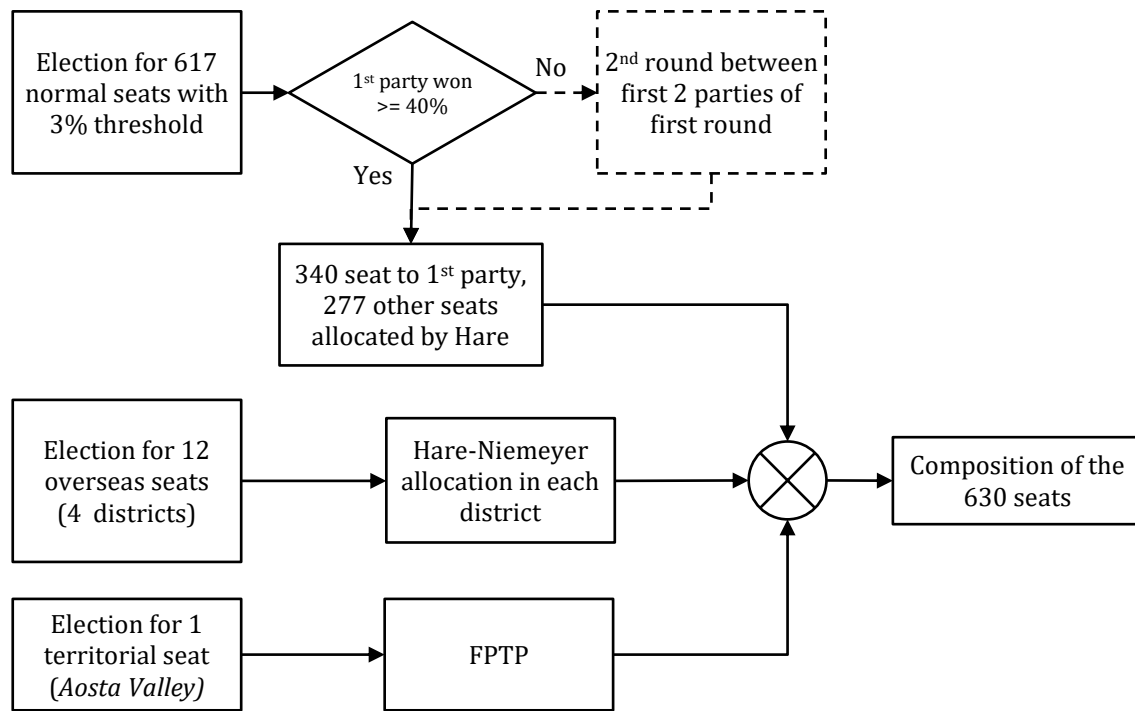


Figure 5.10
The Italian electoral system flowchart (electoral law: 2017)

The Italian Chamber of Deputies has 630 members of which 617 are nationally allocated to parties using the Hare-Niemeyer method if they win 3% of the valid national vote. 12 additional members are separately elected in 4 multi-member constituencies representing the Italians living abroad. In each of these four constituencies, seats are allocated locally using the Hare-Niemeyer method. Finally in one exceptional district (The Aosta Valley) election is held to determine 1 representative. Aosta Valley is a semi-autonomous region of Italy and parties contesting in this district and representing local interests of the region are usually different from the national parties.

At the national level, if the leading party wins at least 40% of the votes cast for the 617 normal seats in the first round of the election, it is allocated 340 seats (54% of the seats) and the remaining 277 seats are distributed between the remaining parties using the Hare-Niemeyer Method.

At the time of writing the initial draft of this research, we simulated *Italicum* in the form that it was ratified in 2015. However, we re-ran the simulation in 2017 to see how this last

amendment to the electoral law will impact the disproportionality of the *Italicum*. Table 5.14 shows the simulation results for the Italian electoral system.

Table 5.14

The impact of electoral design components on disproportionality
Simulation results for the Italian electoral law used in the 2015 and 2018 general election

Electoral system design	D_a (%)
1. Italicum as enacted in 2015	22.52
2. No threshold (Italicum as enacted in 2015)	22.46
3. Italicum after 2017 amendment	10.05
4. No threshold (Italicum after 2017 amendment)	6.63
5. No first party bonus	3.79
6. No first party bonus, no foreign constituencies	3.92
7. No first party bonus, no threshold	0.42
8. No first party bonus, no foreign constituencies, no threshold	0.17
9. No first party bonus, no foreign constituencies, no threshold, no Aosta Valley quota	0.00

The simulation results indicate that the majority bonus induces a large disproportionality to the otherwise proportional electoral system of Italy. Without the majority bonus, disproportionality drops to a mere 3.79% (table 5.14, row 5) comparable to many of the proportional systems. Although the *Italicum* of 2015 was never used in an election, the *Porcellum* system of 2005-2015 must have had a similar disproportionality level given the high similarity between the two.

The disproportionality of the amended *Italicum* is significantly smaller (10.05% vs. 22.52%) because the occurrence of the majority bonus is more sporadic under this system. Under the amended *Italicum*, almost 40% of the disproportionality is attributable to the electoral threshold while 60% still emanates from the majority bonus provision (table 5.14, row 4 vs. row 3).

Finally, districts for expats and the special district of Aosta Valley have an insignificant impact on the disproportionality of the Italian system (table 5.14, rows 8 and 9 compared to row 7).

As we move to the next chapter to analyse the effect of electoral disproportionality on income inequality, we will use the disproportionality of the 2015-*Italicum* because this is a closer approximation of the electoral disproportionality that Italy has lived through in the past decade.

Notwithstanding the enormous disproportionality caused by the majority bonus in this otherwise highly proportional class of electoral systems, a major difference between the MBS and the majoritarian family of systems is that in any case under the MBS a significant number of the seats in the parliament are distributed by proportional rules among parties other than the leading party (277 in the case of Italy or 45%). Despite undermining the bargaining power of the opposition parties, at least this design prevents the electoral system from reducing the number of parties in parliament to levels seen in the majoritarian systems. Contrary to the majoritarian systems which usually result in two or sometimes less than two effective parliamentary parties, the effective number of parties in the Italian parliament between 2005 and 2013 has been 3.6.

5.7 The electoral disproportionality of parallel systems (case study: Hungary)

Nine cases in our sample may be identified as parallel electoral systems of which we have simulated seven given the availability of data. Parallel systems utilise a majoritarian method to decide the allocation of a portion of the seats and a proportional method to determine the fate of the rest when these two parts are generally independent and of comparable sizes. As in the MMP, voters typically cast two votes one for the constituency and one for the party list. The ratio between the seats in the majoritarian and the proportional modules in the parallel systems varies between $\frac{1}{2}$ and 2.⁸¹

In two countries (Panama and Burkina Faso) we are not technically dealing with a parallel system. The Panamanian system is a case of local allocation of the seats using a variant of the LRM method (see section 5.6.1). However, since almost half of the electoral districts in Panama are SMDs, in reality it produces a level of disproportionality that is very close to the parallel systems. Still, it must be made clear that the Panamanian system involves a single ballot paper per voter used to elect the local MP of each electoral district. The Burkinabe system is very similar to the Panamanian system in terms of its structure of districting. The only addition is that the same vote is used twice: once to determine the local representative(s) of the district and once to elect 16 MPs at the national level (out of 127) both using Hare-Niemeyer method. Similar to the parallel systems, the two mechanisms are totally independent (Ariotti 2016). Categorisation of Panama and Burkina Faso in the parallel system family is a reluctant choice to avoid unnecessary complication in classification.

Parallel systems should not be confused with the MMP. Under the MMP the majoritarian component of the electoral system is subdued to the proportional component. In other words, proportional seats are reserved to fix the disproportionality caused by the majoritarian module, whereas in parallel systems there is no such thing as compensation as if the electoral system is used to form two parliaments in every election. The two parliaments then mix together to form the national assembly. In comparison, this class of electoral systems stays below the semi-proportional class in terms of its proportionality. Our simulations yielded an average of 17.25% disproportionality for countries in this family (excluding Panama and Burkina Faso).

Table 5.15 lists countries currently using the parallel electoral system and the method each uses for their majoritarian and proportional modules. The typical design of parallel systems is a combination of several single member districts with first-past-the-post allocation and a national multi-member district allocating the seats by either by the Hare-Niemeyer or the D'Hondt method.

⁸¹ South Korea uses a parallel system with 85% of the seats in the majoritarian module and only 15% in the proportional module (Cho 2004). Hence, rather than categorizing South Korea in the parallel system family, it is placed among the (mixed) majoritarian systems.

Table 5.15

Countries using the parallel electoral system and the characteristics of their systems

Country	FPTP seats	PR seats	$\frac{FPTP}{PR}$	FPTP electoral system	PR electoral system	Simulated?
Japan	295	180	1.6	FPTP in SMDs	Local D'Hondt	✓
Burkina Faso	74	37	2	Binomial	National and Local Hare	✓
Panama	33	38	0.9	Local Double-Quotient in SMDs and DMDs	Local Double-Quotient	✓
Taiwan	73	34	2.1	FPTP in SMDs	National proportional (method unknown)	✗
Hungary	106	96	1.1	FPTP in SMDs	National D'Hondt	✓
Russia	225	225	1	FPTP in SMDs	National D'Hondt	✓
Armenia	41	90	0.5	FPTP in SMDs	National Hare-Niemeyer	✓
Georgia	73	77	0.9	FPTP in SMDs	National Hare-Niemeyer	✓
Mexico	300	200	1.5	FPTP in SMDs	National Hare-Niemeyer	✓
Lithuania	71	70	1	Two-round system*	National Hare-Niemeyer	✓
Senegal	90	60	1.5	Party Block Vote	National Hare-Niemeyer	✗

* This element of the electoral system has not been simulated in this research and is replaced with FPTP.

In this group, Japan is a clear outlier due to the restrictive nature of the proportional module used in its electoral system. Rather than having a national constituency in this module, the Japanese system uses a semi-proportional design with allocation to 11 multi-member provincial districts (Election system in Japan 2007, 29-32; Wada 2004). This design further deteriorates the possibility of achieving proportionality in the electoral system.

The Hungarian electoral system

Since transition to the multi-party democracy, Hungary has experienced two electoral systems. Despite its complications, the initial system (1990-2010) was inclined towards higher proportionality (Moser & Scheiner 2004) compared to the system that was enacted in 2011 (Nagy 2015). The previous system consisted of three tiers: SMDs, regional MMDs and national compensatory seats with linkages between them to transfer vote from one tier to another.⁸² It also included runoff election if district or constituency turnouts were below certain thresholds.

Hungary is selected from this family because of the existence of an interesting component in the design of its electoral system called 'surplus vote'. In the 2011 electoral code, the number of MPs reduced from 386 to 199. Hungarian voters now cast two ballot papers in the election: one for their local constituency and one party vote. 106 seats are allocated to local SMDs. A single plurality is enough for a candidate to win the electorate seat (Nagy 2015). The remaining 93 seats are up for contest among parties in a nation-wide electoral district with a threshold of 5%

⁸² In Italy this system is known as Scorporo and was used until 2005. Scorporo system counts excess vote from one tier towards determining the outcome in another tier to bring more proportionality. Because of this, Scorporo may be placed somewhere between parallel and MMP system in terms of its disproportionality.

or 10% for two party coalitions or 15% for three party coalitions (Kovács & Vida 2015). “Only parties that are able to nominate at least 27 candidates in at least nine counties (including Budapest) can set up a national list” (Kovács & Vida 2015). Hungarian expatriates are allowed only to cast a party list vote. Registered members of the ethnic minorities are entitled only to vote for the parties of their corresponding ethnic group.

The electoral formula for the national constituency is D’Hondt. For minority lists, the representation bar is lowered and only a quarter of the Hagenbach-Bischoff quota is sufficient to obtain their first mandate (see appendix C for the description of Hagenbach-Bischoff quota). But because this arrangement has not been enough to accommodate the independent representation of the minorities (most notably the Romas), it may not be considered as a minority quota.

The seat allocation procedure

Figure 5.11 outlines the seat allocation process according to the Hungarian electoral law.

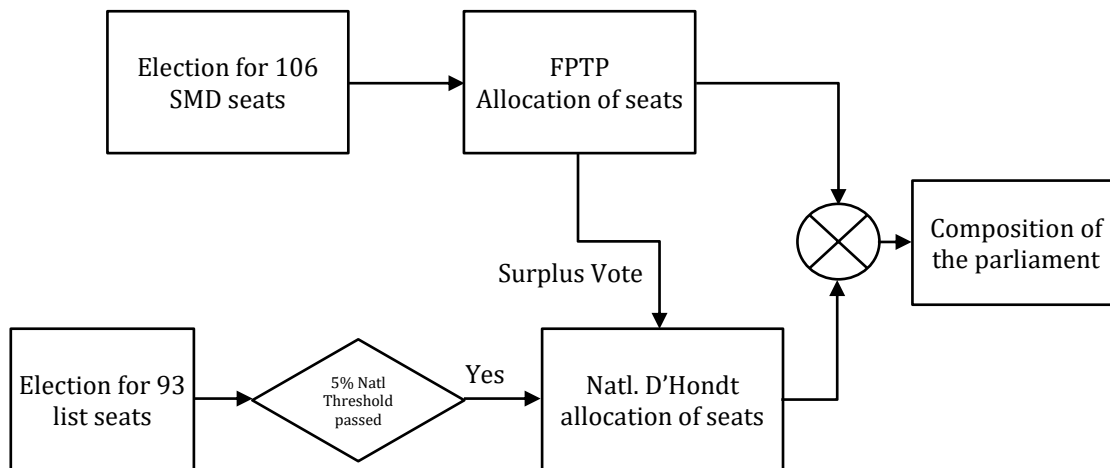


Figure 5.11

The seat allocation diagram for Hungarian electoral system (general election 2014)

The surplus vote mechanism is an arrangement by which any vote that has not been translated into seats at the local level is advanced to the national level for deciding the allocation of 93 party-list seats providing that the party in question has already won 5% of the national vote. This is somewhat of a residual element from Hungary’s previous electoral system. Let v_e be the matrix of votes for the first 9 parties in a local electorate.

$$v_e = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9\}$$

Then the matrix of surplus votes from that electorate to be advanced to the national level would be:

$$\text{Surplus vote} = \{v_1 - (v_2 + 1), v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9\}$$

Surplus vote is defined such that in every local district, the winning party only needs $v_2 + 1$ votes to stand on top of the other parties and win the local seat (Lublin 2017). Despite being a remedy for the disproportionality of the single member districts, the effectiveness of the surplus provision is limited. The very fact that the fate of less than half of the seats is decided by the proportional module of the system means that the overall disproportionality can not be effectively reduced to the level of an MMP system. The results of simulations are presented in table 5.16 to offer a better understanding of the impact of surplus vote transfer arrangement on electoral disproportionality.

Table 5.16

The impact of electoral design components on disproportionality
Simulation results for the Hungarian electoral law used in the 2014 general election

Electoral system design		D_a (%)
1.	Current electoral system	18.08
2.	Hare-Niemeyer mechanism for national distribution	17.74
3.	Size of parliament increased to OSL_a (236) when extra seats are added to the proportional module of the system	15.85
4.	National threshold removed	15.31
5.	Surplus vote mechanism removed	19.45

An overall disproportionality of 18.08% puts Hungary above the average of the parallel family (17.25%). National threshold and the small size of the proportional module are the main drivers of this high disproportionality. But even fixing these issues can not reduce D_a significantly. A resolute conclusion from the simulation results is that the parallel system is by nature very resistant to disproportionality reducing arrangements and none of these arrangements are very effective in tackling the disproportionality caused by the majoritarian module of the system. Comparing rows 1 and 5 of table 5.16 suggests that the surplus vote mechanism helps reducing disproportionality but by a mere 1.24 %.

As in the MMP systems, voters in parallel systems have good incentives for casting different electorate and party votes. Here too, we decided to model the most common form of strategic voting to see whether it exposes disproportionality or masks it in parallel systems. By this common form we are simply referring to the type 1 strategic voting explained in section 5.6.2. Thus, we use the same module we developed for modelling the type 1 strategic voting under the MMP. Results are presented in table 5.17.

Table 5.17

Simulation of type 1 strategic voting for parallel systems

Country	D_a (no strategic voting)	D_a (type 1 strategic voting)
Armenia	14.17	13.87
Georgia	16.56	16.11
Russia	22.12	20.93
Lithuania	18.40	17.68
Hungary	18.08	18.53
Japan	18.63	18.07
Mexico	12.79	12.01
Average	17.25	16.74

Based on the results reported in the table 5.17, type 1 strategic voting reduces disproportionality in parallel systems by 0.5% on average which is not significant. Generally, direction of this effect is in line with what happens under the majoritarian systems. The type 1 strategic voting is the most prevalent form of strategic voting under majoritarian systems and it masks disproportionality inherent in these systems. The effect is the same in parallel systems except for the fact that it is mitigated by the proportional module of the system. Yet, thanks to its surplus vote mechanism, Hungary is the only parallel electoral system in which the type 1 strategic voting increases disproportionality.

5.8 The electoral disproportionality of majoritarian systems

We identified 37 democracies with some form of majoritarian electoral system. Appendix C provides a full list and categorisation of majoritarian electoral systems. The 37 countries on the list occupy seven of the classes and sub-classes discussed in appendix C and section 5.4. These include First-Past-the-Post (FPTP), Binomial, Two-Round-System (TRS), Multiple non-Transferable Vote (MNTV), Single non-Transferable Vote (SNTV), Limited Alternative vote (LAV) and Party Block Vote (PBV). Some countries do not entirely fall into a single category. For example, Madagascar uses FPTP for a portion of the seats and Binomial system for the rest while Venezuela uses a combination of FPTP and MNTV. These cases may be titled as Mixed-Majoritarian systems although this designation can be broad and vague because any mix of majoritarian systems falls under this title. Therefore, we have not defined a class with this title in our classification but rather use the ‘mixed-majoritarian’ as a residual category.

Of the seven classes enumerated above, we chose to simulate only two: First-Past-the-Post and Binomial. This is either due to limitation of data for some cases or theoretical challenges involved in the simulation of a few classes of majoritarian systems. Before moving on, we briefly introduce ‘Two-Round System’, ‘Multiple Non-Transferable Vote’ and ‘Limited Alternative Vote’ and explain challenges they pose to the use of the simulation approach.

Two-round system (TRS): this system is currently used only in Mali, Comoros and France. In the Comorian and French versions of the TRS, country is divided into single member electoral districts. If a candidate wins an absolute majority of the votes in the first round, they are declared the winner. If no candidate wins an absolute majority (50%), those candidates who secured at least a 12.5% share of the vote in the first round proceed to the second round of the

election. In this round a plurality of votes would suffice for winning the local seat. The Malian system combines TRS with party block vote so we will explain its design under the title 'Party Block Vote'.

Simulation of two-round systems is specifically challenging since each election involves two consecutive incidences of voting, and voters use information from the first round to vote in the runoff. Accordingly, parties use this information to reposition themselves and exchange favours by pulling their candidates out of the contest in the runoff in certain districts to increase the chance of other candidates to win in those districts. Parties do so in exchange for reciprocity from other parties in districts where their own candidate is likely to win. In simulation, making reasonable assumptions about the process by which these tactical realignments of voters and parties take place is difficult and requires in depth knowledge of party pacts and voters' incentives and inclinations on a case by case basis. We are not aware of any research so far that has attempted at theorising tactical voting in TRS.

Multiple non-transferable vote system (MNTV): is a form of the block vote system. These two names are used interchangeably in the literature; however, to avoid confusion, here we use the term 'Block Vote' as the most general form of all categories of majoritarian systems in which a majoritarian electoral formula is used in a multi-member district (see appendix C section C.3.1 for details) and MNTV as one class of this family.

Under the MNTV, voters vote for several candidates in multi-member districts but these candidates can be selected from a combination of parties. Candidates with the highest vote in the district will be elected from the district. MNTV is only used in Mauritius (for 62 out of 70 seats) and Venezuela (for 47 out of 167 seats). From the simulation perspective, modelling MNTV requires complicated assumptions about the likely behaviour of the voters when they are allowed to vote for candidates from different parties. Thus, unlike Panachage, under MNTV the assumption of one person casting one vote for one party becomes irrelevant in practice and careful empirical investigation of voters' patterns of voting in countries where this system is or has been in use is a prerequisite for proper election simulation.

A special case of the MNTV is called 'Single non-transferable vote' (SNTV) system. Under the SNTV, voters only vote for one candidate in a multi-member district and candidates with the highest vote are elected from the district (see appendix C section C.3.1.1 for elaboration). Vanuatu and Afghanistan currently use the SNTV for their legislative election. In the past, SNTV was in use in more countries such as Japan, South Korea and Taiwan (Grofman 1999; Reynolds & Reilly 2002) but it was eventually phased out. The reason is that SNTV is strongly anti-partisan because if parties run multiple candidates in an MMD, those candidates will have to compete against each other too because voters only vote for one candidate and it breaks the vote of the party in the district. As such, SNTV centres elections on personalities rather than parties and is assessed to be divisive and triggering intraparty factional competition (Thayer 1969 quoted in Katz 1980, 9; Cox & Rosenbluth 1993). Technically SNTV elections are easy to simulate but for lack of proper data no case of SNTV is included in our simulations.

Party block vote system (PBV): is only used in Mali, Cote d'Ivoire, and Senegal for the election to the lower house of the legislature. In the Malian system, districts are of variable sizes. Each party is expected to nominate as many candidates in each constituency as the number of seats contested in that constituency. The vote count system used is called party block vote. As in proportional systems, voters vote for one party in every district. However, when tallying the

votes, the party that wins an absolute majority of the votes wins all of the district seats. If no party can pass the 50% threshold, the two most popular parties go to the second round where the winner of the election wins all of the district seats. In Cote d'Ivoire, a third of the MPs are elected using PBV in multi-member districts and the other two-thirds are elected using FPTP in single member districts. In Senegal where a parallel system is in use, PBV is implemented for the election of 90 MPs in the majoritarian module of the system.

Party block vote is extremely undemocratic since it produces a large disproportionality in the seat allocation to parties (see appendix C). From the simulation perspective PBV is easy to model. Yet because its use is very rare we do not include this system in our simulations.

Preferential block vote: whenever in the MNTV or PBV classes winning absolute majority is required for candidates or parties to win seats, instead of a two-round-system an instant runoff module may be implemented in the electoral system. This design is less costly and is called the preferential block voting. Preferential block voting may be used either with SMDs or MMDs. When the electoral system is only comprised of SMDs, the system is simply called 'preferential voting' or 'alternative voting'. In the preferential system, "first preference" of voters are initially tallied, and candidates winning a majority of these are declared elected. 'Second and lower preferences' are taken into account only if no candidate secures a majority of first preferences. The candidate who receives the smallest number of first preferences is eliminated, and second preferences expressed on their ballots are counted and transferred to other contestants. If this operation produces a winner, the contest is over. If not, the weakest candidate remaining is eliminated and subsequent preferences on their ballots (which then means third preferences on transferred ballots and second preferences on untransferred ballots) are similarly transferred, and so on until eliminations and transfers produce a majority for one of the remaining candidates." (Blais & Massicotte 2002, 44-45).

We are not aware of any democracy that currently utilises preferential block vote with either MNTV or PBV. Only Papua New Guinea and Australia use preferential voting and they utilise it in single member-districts. The two systems differ only in one aspect. While in the Australian election to the lower house, voters have to rank all candidates in their constituency, the Papuan system requires voters only to express three preferences. That is why the latter system is called 'Limited Alternative Vote' (LAV).⁸³ Again, modelling such systems requires complex and potentially arbitrary assumptions about the relation between multiple preferences of the voters which is why this class of systems is not included in our simulation.

We can now move on to present examples of simulation for two classes of majoritarian electoral systems namely the FPTP and binomial systems.

5.8.1 First-Past-The-Post electoral system (case study: Botswana)

FPTP is the least complicated of all electoral systems (Blais & Massicotte 2002). In the FPTP system, the whole country is divided into multiple single member districts and seat allocation takes place at the district level. Any party or independent candidate who gets a plurality of the votes in a district is elected to the legislature from that district. An absolute majority of the majoritarian systems use the FPTP formula. 24 countries solely use FPTP for their legislative elections while 11 more have a sizable FPTP module in their electoral system (i.e., South Korea,

⁸³ See Johnston and Forrest 2009 for a proposal on how to calculate disproportionality of AV electoral systems.

Philippines, Venezuela, and all parallel systems). Simulation on 24 country cases yields an average disproportionality of 30.03% for this class of electoral systems. The single most important source of disproportionality in the FPTP systems is the small size of electoral districts.

Other typical contributors to disproportionality in the FPTP systems (discussed in section 4.2) are:

1. *Geographical concentration of party votes in certain constituencies*: the random nature of splitting the national results into constituencies in our simulation approach (section 5.3.1) guarantees geographical concentration of the vote of some parties in a portion of the units in the input sample. Yet, in countries where some minor parties with geographically concentrated vote are an institutionalised part of the political landscape (such as in the UK), systemic disproportionality is lower because waste vote decreases with the concentration and separation of the party vote bases. More accurate simulation of these cases requires further assumptions regarding the geographic pattern of party votes. Such undertaking is beyond the scope of this study.
2. *Gerrymandering*: not only a very controversial political practice, gerrymandering helps concealing disproportionality by minimizing the waste vote. As a result, a proper measurement of disproportionality needs to control for the effect of gerrymandering. The simulation approach satisfies this criterion by randomly splitting national vote to the electoral districts.
3. *Difference in the voting eligible population of SMDs (malapportionment)*: For a number of countries simulated in this class, data on the exact size of the eligible voters per districts is not available. These countries include: USA, The Bahamas, Bangladesh, Ghana, Nigeria, Sierra Leone, Tanzania, and South Korea. As a result, in these cases we assume equal voting population per district; an assumption that leads to the underestimation of disproportionality. However, because generally assigning equal voting population to electoral districts is a key undertaking of the electoral commissions in countries using the FPTP systems, the degree of variation in voting eligible population of districts is quite contained in such countries. As will be shown in the case of Botswana, malapportionment generally has a very small impact on the disproportionality in systems with single member districts.

The FPTP systems are fairly simple in their design and barely have any manipulable component to reduced disproportionality. To present an example from this class we chose one that involves an extra component compared to a typical FPTP system. The additional provision involves the appointment (in-direct election) of a few extra MPs to the parliament by automatic entitlement or by the vote of the elected MPs. This mechanism may be found in a handful of countries, including Botswana, Zambia, Kenya, Tanzania, Cote d'Ivoire, Sierra Leone, and Nicaragua.

Among the countries that use FPTP, Bangladesh, Pakistan and Tanzania use a quota for women and religious minorities (only Pakistan). As examples of the 'bridging strategy' (see section 5.3.3) these quotas appear in the form of adding a fixed number of women (and minority) MPs to the elected representatives of each party in proportion to party's acquired seats based on the election outcome. Since this type of quota does not introduce additional distortion from proportionality to the seat share of the parties, gender (and minority) quotas do not need to be included in our simulations.

The electoral system in Botswana

The parliament of Botswana has 63 seats of which 57 are directly elected in single member districts. Once a new parliament is formed, it elects the president of the republic who by virtue of her/his office becomes a member of the parliament. Attorney general is the second ex-officio official who automatically becomes an MP (constitution of Botswana, article 58). Four remaining members are nominated by the president and have to be approved by the parliament as the 'specially-elected members'. In cases when the key figures of the winning party fail to enter the parliament from their constituencies, this arrangement often allows them to get elected without being voted in (Good 1996; Balise 2014). The special members, president and attorney general enjoy full voting rights of their elected colleagues (Good 1996).

The same electoral system has been in use since Botswana's independence in 1965 (Maundeni 2005, 30). However, size of the parliament and the number of specially elected MPs has increased over time. Figure 5.12 shows the electoral system in Botswana.

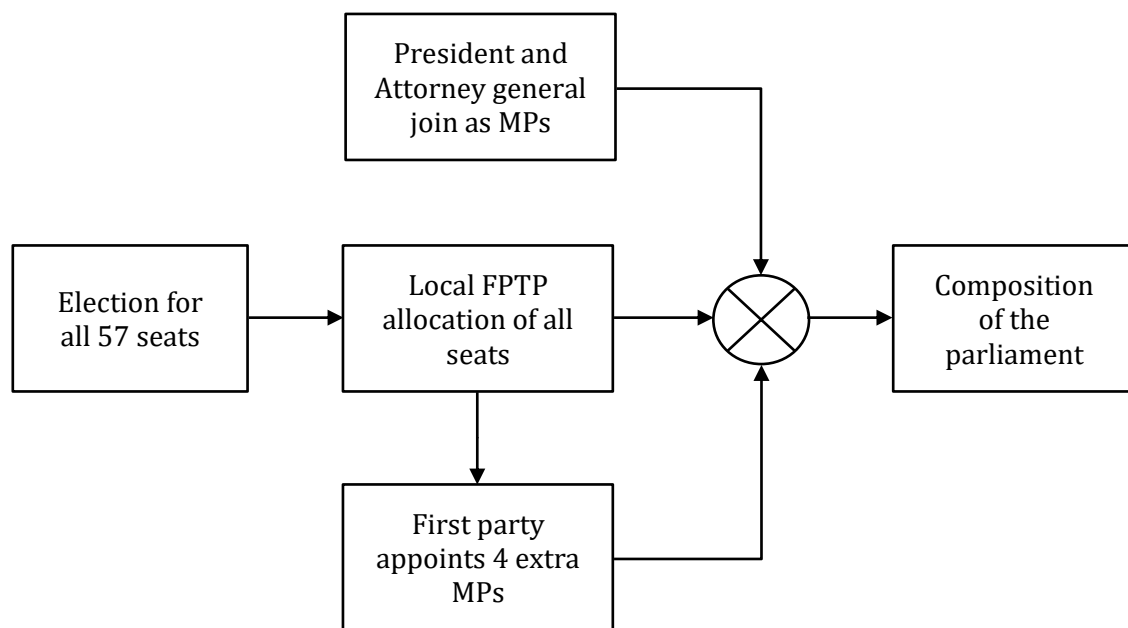


Figure 5.12

The Botswana electoral system flowchart (electoral law: 1965)

Apart from the disproportionality caused by the size of the electoral districts, the other three sources of disproportionality are: (1) the small size of the legislature, (2) malapportionment of the seats to electoral districts (difference in population size among the districts), and (3) unelected MPs. In the case of the unelected MPs, except for the attorney general who is not a partisan, the President and the special MPs are de facto appointees of the party that is in absolute majority in the parliament, an outcome that is highly likely under FPTP. Even if the largest party only holds a relative majority and has to form either a minority government or a coalition government, it is still very probable that the 5 unelected MPs would be the members or associates of this party. Table 5.18 presents the results of our simulations for Botswana.

Table 5.18

The impact of electoral design components on disproportionality
Simulation results for the Motswana electoral law used in the 2014
general election

Electoral system design	D_a (%)
1. Current electoral system	31.88
2. All districts have equal voting eligible population	32.33
3. Size of parliament increased to OSL_a (108) with districts having equal voting eligible population	31.26
4. Unelected seats eliminated	30.13

Simulation reveals a very high aggregate disproportionality for the electoral system of Botswana (31.88%). Much of the extra disproportionality existing in this system compared to an average FPTP, may be attributed to the unelected MPs (about 10% of all MPs in Botswana) (table 5.18, row 4 vs. row 1). Also, the size of the Motswana parliament is considerably smaller than its optimal size (57 instead of 108). Correcting for this can improve proportionality by a scant 1%. The voting eligible population in the electoral districts of Botswana varies in size between 7,000 and 20,000. Interestingly, correcting for this malapportionment (i.e., setting district populations as equal) not only has no positive effect but also worsens the systemic disproportionality index by 0.55% (table 5.18, row 2 vs. row 1). This is somewhat counterintuitive but we think that because the distribution of the waste vote under FPTP is homogenous among districts the effect of malapportionment is not remarkable in any case. In the next example we will present a case of correction for malapportionment by changing the number of MPs per district instead of assuming equal VEP per district.

5.8.2 Binomial system (case study: Chile)

In the binomial system MPs are elected locally from double member districts (DMDs). Parties or coalitions present a two-candidate list in every electoral districts and the voters vote for lists. Independent of the electoral formula, binomial system produces a high level of disproportionality close to the majoritarian systems. Table 5.19 illustrates this point for a hypothetical country with a voting eligible population of 10 million and a binomial electoral system. We have simulated this system with proportional and majoritarian vote count formulas (LRM, variants of HAM, PBV and SNTV) to find out the range of variation in the systemic disproportionality that is attributable to electoral formula in a binomial system. To avoid unnecessary extra disproportionality from other sources, we set the parliament size at its OSL_a value of 254.

Table 5.19

Modelling the disproportionality of various electoral formulas for a hypothetical binomial electoral system with 10 million voters and 254 ($=OSL_a$) seats

Electoral formula	D_a (%)
Hare	16.55
Sainte-Laguë	20.48
Modified Sainte-Laguë	24.25
D'Hondt	25.01
SNTV	14.43
PBV	30.30

The simulation reveals two interesting points. First, no matter which vote count method is applied, the binomial system is highly disproportional (21.84% on average in the above example). The range of systemic disproportionality that arises from such system places its variants somewhere between parallel systems and majoritarian systems. The second inference is that while proportional vote count methods increase disproportionality in the descending order of their inherent capacity for proportionality (see appendix C), SNTV, when combined with double member districting, produces a lower level of disproportionality than all other formulas. Here we elaborate briefly on this observation.

In an election in a double member district, either both seats are won by the first party (in vote terms) or the second seat will go to the second party. If both seats are won by the leading party, the level of disproportionality would increase because given the attributes of the voting outcome sample that we use as the simulation input, statistically less votes are likely to gain representation because a significant portion of the votes go to parties other than the first party.⁸⁴ Therefore, the level of disproportionality that each electoral formula produces in a binomial system is directly related to the likelihood of the second seat in the districts going to the second party. The lower this likelihood would be with an electoral formula, that formula would produce higher disproportionality under a binomial system. This likelihood is calculated and compared for various electoral formulas below.

SNTV: by definition in this formula the second seat will always go to the second party.

Hare-Niemeyer: to allocate the seats, vote of the parties is first divided by the electoral quotient. If the total vote in a DMD is shown by V the electoral quotient would be $q = \frac{V}{S} = \frac{V}{2}$. Let V_1 be the number of votes for party P_1 and V_2 the number of votes for party P_2 and parties are ranked in the descending order of their votes.

If $V_1 < \frac{V}{2}$, then vote of neither party can enumerate the quotient and P_1 and P_2 each gain 1 seat (see appendix C for explanation). If $V_1 > \frac{V}{2}$, then the first seat goes to P_1 and its vote is reduced by the quotient: $V'_1 = V_1 - \frac{V}{2}$. The fate of the second seat depends on the magnitude of the

⁸⁴ In our survey of voting patterns in proportional systems, the first party wins an average of 36% of the vote, the second party wins around 21% etc. (see figure 4.7)

fraction of the quotient that V_1' and V_2 can enumerate. The second seat will go to the first party only if $V_1' > V_2$ that is if $V_1 - \frac{V}{2} > V_2$ or $V_1 > V_2 + \frac{V}{2}$. This means that the first party can win both seats only when its vote share is higher than 50% of the votes + the vote of the second party. In reality, this is highly unlikely unless the first party is extremely more popular than any other party in a district.

Sainte-Laguë: under Sainte-Laguë the allocation table is as below and the first seat will always go to the first party because $V_1 \geq V_2$.

	$\frac{V_i}{1}$	$\frac{V_i}{3}$	$\frac{V_i}{5}$
V_1	V_1	$\frac{V_1}{3}$	...
V_2	V_2	...	...
V_3	...	...	...

The only issue that matters in determining the fate of the second seat is whether $\frac{V_1}{3} > \frac{V_2}{1}$ or $V_1 > 3 V_2$. So, for both seats being won by the first party, it needs to have triple times the vote of the second party.

Modified Sainte-Laguë: under Modified Sainte-Laguë the allocation table is as below and the first seat will always go to the first party because $V_1 \geq V_2$.

	$\frac{V_i}{1.4}$	$\frac{V_i}{3}$	$\frac{V_i}{5}$
V_1	$\frac{V_1}{1.4}$	$\frac{V_1}{3}$	...
V_2	$\frac{V_2}{1.4}$	...	...
V_3	...	...	...

The only issue that matters in determining the fate of the second seat is whether $\frac{V_1}{3} > \frac{V_2}{1.4}$ or $V_1 > 2.14 V_2$. So for both seats to be won by the first party, this party needs to have 2.14 times the vote of the second party.

D'Hondt: under D'Hondt, the allocation table is as below and the first seat will always go to the first party because $V_1 \geq V_2$.

	$\frac{V_i}{1}$	$\frac{V_i}{2}$	$\frac{V_i}{3}$
V_1	V_1	$\frac{V_1}{2}$	...
V_2	V_2	...	...
V_3	...	...	...

The only issue that matters in determining the fate of the second seat is whether $\frac{V_1}{2} > V_2$ or $V_1 > 2V_2$. So for both seats to be won by the first party, this party needs to have double the vote of the second party.

PBV: both seats always go to the first party.

This analysis shows that in a binomial electoral system, for each district, the likelihood of first party winning both seats increases from 0 in the case of SNTV to $E(V_1 > V_2 + \frac{V}{2})$ for Hare-Niemeyer to $E(V_1 > 3V_2)$ for Sainte-Laguë to $E(V_1 > 2.14 V_2)$ for Modified Sainte-Laguë to $E(V_1 > 2 V_2)$ for D'Hondt, and to 1 for PBV. This is why disproportionality of Modified Sainte-Laguë formula is much closer to the D'Hondt formula than to Sainte-Laguë and also why SNTV yields more proportional results when applied in DMDs compared to proportional formulas.

Application of the binomial system is extremely rare. The only country that ever used a full binomial system for the election to its house of representatives was Chile. This system was in place in Chile from 1989 to 2016 when it was replaced by a local D'Hondt proportional system (see section 5.6.3). However, partial use of the double member districts may be found in a few countries as per table 5.20. In Burkina Faso, around 60% of the seats are locally allocated in the DMDs. This may be interpreted as the majoritarian module of the Burkinabe parallel system. In Madagascar and Venezuela around 40% of the MPs are elected from DMDs. Finally in Mali, Cote d'Ivoire, and Togo the fate of 20-25% of the seats is decided in double member districts.

Table 5.20

Use of double member districts in national electoral systems across the world

Country	Total Seats	MPs elected in DMDs	% MPs elected in DMDs	Electoral system family	Vote count method for binomial module
Burkina Faso	127	74	58	Parallel	Hare
Venezuela	167	74	44	Majoritarian	D'Hondt or MNTV
Madagascar	151	64	42	Majoritarian	D'Hondt
Mali	147	38	26	Majoritarian	PBV + TRS
Cote d'Ivoire	255	58	23	Majoritarian	PBV
Togo	91	18	20	Semi-proportional	D'Hondt

The electoral system in Chile

From 1925 until the 1973 interruption in the Chilean democracy, Chile enjoyed a semi-proportional electoral system with an average district magnitude of 5. The relatively low threshold of representation offered by large district magnitudes allowed for the representation of a variety of parties in the parliament (Siavelis 1997 & 2005).

Upon the restoration of democracy in 1989, the binomial system was imposed in Chile by the administration of the outgoing right-wing dictator Augusto Pinochet to foster the development of a two-party system and reduce the chance of the left-wing parties to win sweeping victories during the transition back to democracy (Navia & Sandoval 1998). The fear of short-term

political implications in the highly polarised and fragmented party system of Chile dissuaded this administration from instating an FPTP system and hence Chile became the only country in the world to use a fully binomial electoral system at the national level (Siavelis 1997, 657). This system brought stability to the Chilean politics only at the cost of restricting representation. Under the binomial system, the effective threshold of representation in Chile ranked among the highest in Latin America (Diamond et al. 2005, 141). Despite the reluctance of the larger parties, opposition was gradually built up against the binomial system until the discontent culminated in the reform of the system in 2013 and restoration of a semi-proportional system similar to the one that had been used in the pre-coup era. The new system was first used in the 2017 general elections.

The former Chilean electoral system (1989-2013) consisted of 120 MPs elected in 60 double-member electoral districts using the D'Hondt seat allocation formula. Each party would nominate two candidates in each district in open lists. Voters were required to vote for a party and also rank party candidates in their order of preference. The party or coalition with the highest vote would win one seat and the second seat would go to the second party or coalition unless the vote of the first party was twice as much as that of the second party in the district for the reason explained in the preceding paragraphs. Figure 5.13 shows the vote count flowchart of the former Chilean electoral system.

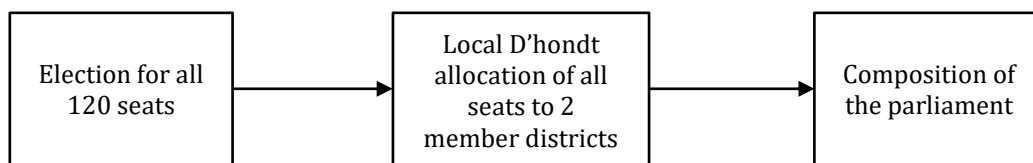


Figure 5.13

The Chilean electoral system flowchart (electoral law: 1989-2016)

Because the case of former Chilean electoral system was the only prototype of a full binomial system, we decided to simulate its disproportionality to emphasise the significance of the district magnitude in determining the overall disproportionality of the electoral systems. Results of the simulations are summarised in table 5.21.

Table 5.21

The impact of electoral design components on disproportionality

Simulation results for the Chilean electoral law used in the 2013 general election

Electoral system design		D_a (%)
1.	Current electoral system	23.99
2.	No malapportionment (DMDs with equal VEP) $\overline{district\ magnitude} = 2$	25.23
3.	Size of the parliament increased to OSL_a (283) and no malapportionment (DMDs with equal VEP per district) $\overline{district\ magnitude} = 2$	25.04
4.	No malapportionment (current VEP per district but proportionate district magnitudes) $\overline{district\ magnitude} = 2$	25.07
5.	Size of the parliament increased to OSL_a (283) and no malapportionment (current VEP per district but proportionate district magnitudes) $\overline{district\ magnitude} = 4.72$	17.06
6.	Hare-Niemeyer formula implemented at the district level	16.15

Results show that the binomial system produces a high level of disproportionality comparable to the majoritarian systems. The three scenarios shown in rows 2, 3, and 4 of table 5.21 all involve manipulations that keep the average district magnitude at 2. Neither of these initiatives (even more than doubling the size of the legislature to OSL_a) can help reducing the electoral disproportionality. Surprisingly, as was discovered in the case of Botswana, these manipulations that intend at reducing disproportionality even exacerbate it (here by about 1%).

When adjustment in the size of the districts relative to their voting-eligible population is accompanied by an increase in the size of the parliament to its optimal size of 283 (table 5.21, row 5), disproportionality drops significantly (by 7%) to 17.06% because the average district magnitude increases to 4.72 seats per district and all districts grow in magnitude. This example reiterates the sensitivity of disproportionality to district magnitude especially at lower average district magnitudes.

Lastly, the case of Chile shows an important difference between HAM and LRM electoral formulas in smaller districts. For the reasons explained before, unlike many of the previous examples, in the Chilean system when the electoral formula is changed to Hare-Niemeyer, disproportionality is reduced by a significant amount (~8%) placing the disproportionality of the electoral system close to parallel systems (table 5.21, row 6 vs. row 1).

5.9 Complete measurement results for 92 democracies

We conclude this chapter by aggregating the results of the simulations for all 92 countries included in this study. These results are shown in table 5.22 that lists the overall disproportionality for each electoral system by country, election year, family and class of the electoral system. Table 5.22 also shows the existing and the optimal sizes of the legislatures based on the demographic information of the election year at stake per every case simulation.

Table 5.22

Systemic disproportionality measurement results using the D_a index for countries included in the study by electoral system category, study year, and the size of the legislature

Class	Sub-class	Country	year electoral system studied	Legislature size	OSL_a	D_a (%)
Proportional	National Largest Remainder Method (Hare-Niemeyer)	South Africa	2014	400	358	0.11
		Namibia	2014	96	124	1.52
		Bulgaria	2014	240	230	6.48
		Moldova	2014	101	167	13.64
		Kyrgyzstan	2015	120	163	30.86
	Local Allocation + National Compensation	Norway	2013	169	180	5.15
		Denmark	2015	179	188	6.14
		Sweden	2014	349	310	6.16
	National Highest Average Method (Sainte-Laguë)	Kosovo	2014	120	141	11.14
	National Highest Average Method (D'Hondt)	Netherlands	2012	150	281	0.89
		Austria	2013	183	218	1.20
		East Timor	2012	65	99	5.22
		Slovenia	2014	90	139	7.23
		Montenegro	2012	81	92	4.22
		Serbia	2016	250	226	7.66
		Slovakia	2016	150	192	9.85
		Fiji	2014	50	96	10.43

Table 5.22 (Continued)

Class	Sub-class	Country	year electoral system studied	Legislature size	OSL_a	D_a (%)
Semi-proportional	Local Largest Remainder Method (Hare-Niemeyer)	Honduras	2013	128	205	4.49
		Guyana	2015	69	96	5.90
		El Salvador	2012	84	155	6.08
		Colombia	2014	166	391	6.43
		Indonesia	2014	560	703	6.34
		Nicaragua	2011	92	174	7.33
		Sri Lanka	2015	225	292	7.97
		Morocco	2011	395	337	9.79
		Benin	2015	83	193	10.32
		Cyprus	2011	56	93	15.28
	Mixed-Member Proportional	Lesotho	2015	120	123	5.58
		New Zealand	2014	121+	171	9.32
		Germany	2011	598+	598	9.67
		Bolivia	2009	130	201	10.35
	Local Highest Average Method (Sainte-Laguë)	Latvia	2014	100	134	10.09
	Local Highest Average Method (D'Hondt)	Brazil	2014	513	634	5.80
		Finland	2015	200	171	7.91
		Macedonia	2014	123	142	8.22
		Niger	2016	171	231	8.42
		Iceland	2013	63	70	8.67
		Mozambique	2014	250	253	9.05
		Portugal	2015	230	252	9.11
		Luxembourg	2013	60	71	9.45
		Albania	2013	140	172	9.88
		Belgium	2014	150	236	9.92
		Czech Republic	2013	200	240	12.07
		Spain	2016	350	397	12.19
		Croatia	2014	151	182	10.86
		Uruguay	2015	99	161	12.44
		Guatemala	2015	158	224	12.62
		Costa Rica	2012	57	150	12.73
		Poland	2015	460	381	13.05
		Peru	2016	130	338	13.11
		Cape Verde	2016	72	80	14.42
		Suriname	2015	51	81	15.16
		Paraguay	2013	80	177	16.17
		Ecuador	2013	137	272	17.59
		Togo	2013	91	169	18.67
		Turkey	2015	550	464	29.02
	Majority Bonus System	Italy	2012	630	453	22.11

Table 5.22 (Continued)

Class	Sub-class	Country	year electoral system studied	Legislature size	OSL_a	D_a (%)
Parallel System	Parallel system (Mixed-Member Majoritarian)	Burkina Faso	2012	127	239	10.56
		Mexico	2015	500	447	12.79
		Armenia	2012	131	157	14.17
		Georgia	2012	150	179	16.56
		Panama	2014	71	157	17.38
		Hungary	2014	199	236	18.08
		Lithuania	2012	141	160	18.40
		Japan	2014	475	569	18.63
		Russia	2016	450	591	22.12
Majoritarian	Binomial System	Chile	2013	155	283	23.99
	First-Past-the-Post	South Korea*	2016	300	417	27.58
		Madagascar**	2013	151	266	27.86
		Solomon Islands	2010	50	87	27.22
		Kenya	2013	350	288	28.65
		Malawi	2014	194	229	28.67
		Jamaica	2016	63	142	28.67
		Zambia	2014	159	203	29.36
		Liberia	2013	73	141	29.46
		Pakistan	2013	342	530	29.62
		India	2014	545	1163	29.76
		UK	2015	650	431	29.88
		Canada	2015	338	352	29.89
		Nigeria	2015	360	490	30.08
		USA	2012	435	759	30.09
		Maldives	2014	85	70	30.11
		Ghana	2012	275	293	30.12
		Bhutan	2013	47	83	30.17
		Bangladesh	2014	350	397	30.37
		Tanzania	2015	389	393	30.82
		Barbados	2013	30	47	30.90
		Trinidad & Tobago	2015	41	119	30.91
		Belize	2013	31	66	30.92
		Bahamas	2013	38	63	31.10
		Botswana	2014	63	108	31.88
		Sierra Leone	2012	124	150	32.03

* Has a small proportional module (47 seats)

** Has a binomial module (64 seats)

Table 5.22 shows a considerable variation in the level of disproportionality within each family of electoral systems. As noted in the beginning of this chapter, this variation relates to the fact that the angle at which we approached the question of classification does not capture the entire variability in the design of the electoral systems.

Despite this variation, comparing the average systemic disproportionality of the electoral system classes can reveal the degree to which we can order them in terms of their disproportionality. Figure 5.14 visualises the data in table 5.22. This graph combines a series of Box and Whisker plots for different classes of electoral systems and shows the median, the

upper and lower quantiles, the maximum and minimum values, and outliers denoted by a blue dots in every class.

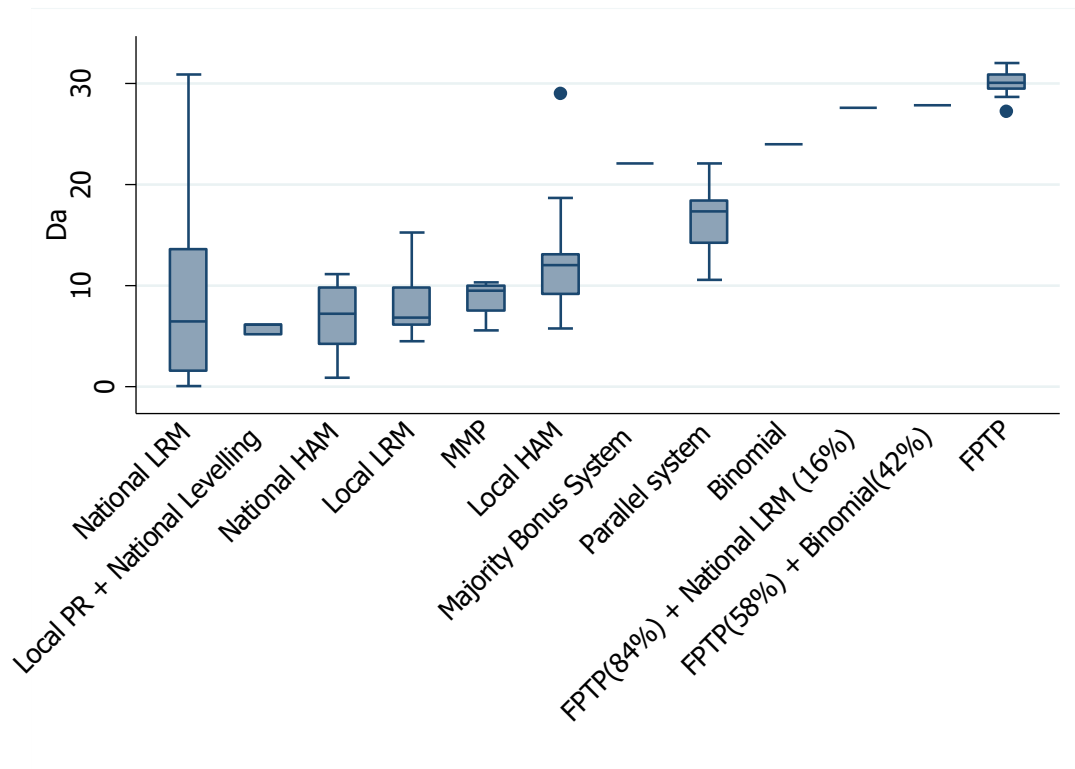


Figure 5.14

Systemic disproportionality of the electoral system families and classes

Figure 5.14 lends support to our theoretical prediction that electoral system families and classes vary significantly on the scale of systemic disproportionality. All four classes of the proportional family (National LRM, Local Allocation + National Compensation, National Sainte-Laguë and National D'Hondt) exhibit almost equal disproportionality on average and together they are the least disproportional classes. In addition to these four classes, one member of the semi-proportional family that is local LRM stands next to the proportional family in terms of its average disproportionality. This outcome is owed to the fact that fewer systems with local districting use electoral thresholds compared to systems in the proportional family. The absence of electoral thresholds automatically contributes to the lowering of disproportionality in this class.

Local HAM, the other populace class of the semi-proportional family stands considerably higher on the disproportionality scale. However, the majority bonus system class exhibits twice as much systemic disproportionality (22.11%) as its neighbouring 'local HAM' class. This result is even higher than the next family (the parallel systems) with an average of 16.52%. MBS is the only class of electoral systems for which the measurement results defy the theoretical classification we introduced at the beginning of this chapter. The level of systemic disproportionality of MBS is similar to that of the binomial class (the lowest in the majoritarian family). Nonetheless, there is a stark difference between the MBS and the majoritarian systems

that makes the classification of MBS as a majoritarian system design problematic. As explained in section 5.6.4, the difference lies in the impact of the electoral system on the effective number of parties that enter the parliament (*ENPP*). This matter will be discussed at length in chapter 6. It has to be recalled that the average figure for the ENPP has been 2.56 for the period 1988-2015 in the majoritarian family and 3.8 in the proportional and semi-proportional families. Italy's effective number of parties in parliament since the implementation of the MBS in 2005 has been 3.6 parties on average. In other words, the MBS would stand out as an outlier in whichever family it is classified in.

In the majoritarian family, binomial class exhibits the lowest disproportionality with 24%. The mixed majoritarian systems of South Korea and Madagascar yield a disproportionality level of 27.58% and 27.86% respectively. As mentioned above, we chose not to cluster these two cases into one class due to the strong differences in the design of their systems. Containing more proportional elements in their design relieves the effect of the SMDs on the disproportionality level of these systems. Ultimately, the FPTP systems stand on top of all other classes of electoral systems with an average disproportionality of 30.03%.

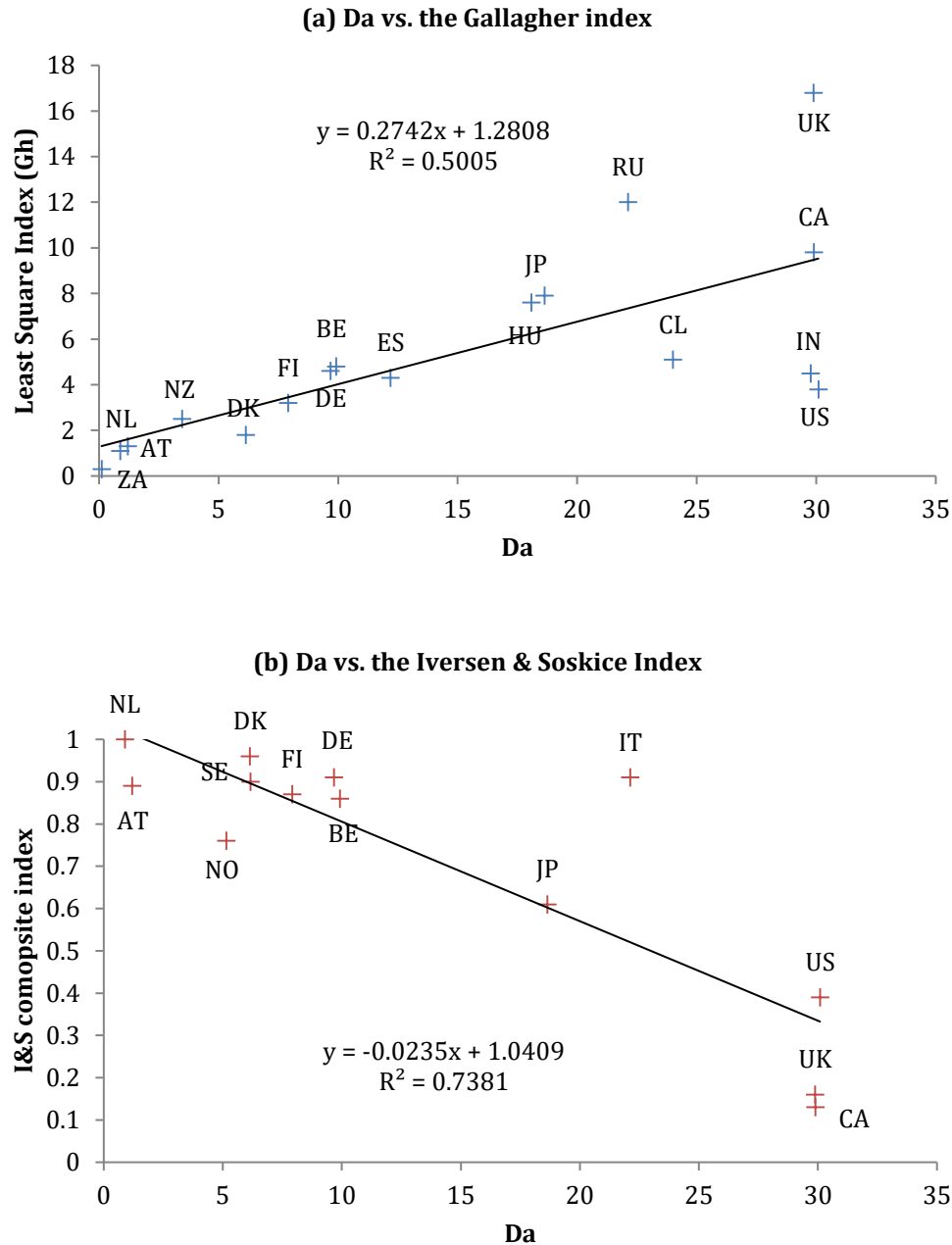
The data in table 5.22 indicate that in practice the highest level of systemic disproportionality measured by the D_a index does not exceed 33%. This may imply that the index can be normalised to 100 if multiplied by 3, but while normalisation has the benefit of making interpretation easier, the raw index contains important information about the share of the seats that have been distributed against to the popular will. As such, the raw index seems to be better interpretable than its normalised version.

This chapter is concluded by comparing the findings of this research with two acknowledged sources of data on disproportionality produced using the empirical approach. These sources are Gallagher (2005), and Iversen and Soskice (2006). Both of their samples are limited to the OECD and BRICS countries.⁸⁵ The former contains 22 cases while the latter reports on 17 countries. Gallagher (2005) used the least square index alternately known by his own name. The Gallagher index was introduced in chapter 4 of this book and ranges between [0-1] or [0-10]. Yet, it remains unclear why few of the figures reported in Gallagher (2005) exceed the value of 10. In the benefit of the doubt we assume consistency in his methodology. Iversen and Soskice explain their index as “a composite index based on Lijphart's measure of the effective threshold of representation and Gallagher's measure of the disproportionality between votes and seats” (2006, 172). Unfortunately, the authors do not offer any further information about their methodology.⁸⁶ The Iversen and Soskice index is an index of proportionality; that is, it decreases with increase in disproportionality with a range of [0-1].

Figures 5.16 (a) and (b) show the value of both indices plotted against the findings of this research. Countries for which the reported disproportionality is related to a disused electoral system (such as New Zealand in Iversen and Soskice 2006) are not included in this comparison.

⁸⁵ The five major developing countries including Brazil, Russia, India, China and South Africa

⁸⁶ Our correspondence with Iversen in 2014 did not help to clarify this ambiguity either.

**Figure 5.15**

The D_a measurement of systemic electoral disproportionality plotted against the Gallagher index and the Iversen and Soskice index

Data: Gallagher 2005, Iversen, and Soskice 2006

As evidenced by the higher R^2 in figure 5.15, our measure relates more closely to that of Soskice and Iversen's calculations than to Gallagher's. In the Gallagher's measurement, the disproportionality of the US and Indian systems are highly underestimated despite these two electoral systems being identical to those of the UK and Canada which are reported to have higher disproportionality. This underestimation which is also the main reason for the weaker association between the Gallagher index and the D_a , is to the degree that the Gallagher index is not capable of distinguishing between the disproportionality of the majoritarian systems of India and the United States on the one hand and the proportional systems of the European

countries in their dataset on the other. This inability speaks to the limitations involved in the empirical measurement of disproportionality.

5.10 Conclusion

In this chapter, we used the D_a index in combination with the simulation method developed in chapter 4 to measure systemic disproportionality for 92 electoral systems currently used in democracies around the world. For this purpose, we categorised these systems into major families and each family into some classes and presented the simulation procedure for one example in every class of electoral systems. Through these in-depth analyses, we reviewed the evolution of the electoral systems in countries under investigation and decomposed disproportionality along different elements of their electoral system designs to get a better understanding of how components and modules of the electoral systems interact in making disproportionality. Finally, simulation results for all 92 countries were presented and used to compare the average disproportionality of different families and classes of electoral systems. We concluded the chapter by comparing the outcomes of our measurement to two scholarly sources of empirical data on disproportionality and showed that the simulation approach can offer a measurement precision that is lacking in the empirical method.

In the next chapter, we will use the simulation results of table 5.22 to assess the validity of the hypotheses developed in literature of political economy regarding the effect of electoral systems on economic inequality (introduced in chapter 2) at a global scale.

Chapter 6

The effect of electoral proportionality on the distribution of income in democracies

6.1 Introduction

In the past few decades, a fair amount of attention has been paid by political scientists to the direct and indirect effects of the political institutions, structures or rules on social and economic policy making and socio-economic outcomes. A prominent institution in democracies which regularly influences the equilibrium of power among social forces is the electoral system. Electoral systems can facilitate the mobilisation of certain social interests and social groups while preventing others from accessing the seats of political decision making. Even when designed to serve such discriminatory purposes in subtle ways, these effects have not escaped the vigilance of political scientists. With first traces emerging in the early 1980s, many studies have tried to capture the effect of electoral systems on the distribution patterns of economic value. This is an important question because electoral systems lend themselves to manipulation and reform more than many other structural determinants of economic inequality.

The majority of studies suggest that a higher proportionality of the electoral system would lead to a better quality welfare system and fairer economic distribution (see chapter 2 for a review of the theoretical studies and section 6.2 for an overview of the empirical research on this topic). However, each of these studies has its own limitations in the conceptualisation and operationalisation of the dependent and independent variables and the causal relations hypothesised, as well as the quality of their empirical data.

The relevant literature has focussed mostly on the question of ‘whether’ there is an association between electoral proportionality and inequality. In this chapter, we move beyond this ‘if’ question to answer ‘when’ or under which circumstances such relationship exists. In so doing, we capitalise on what was developed in the previous three chapters on introducing and measuring a systemic measure of disproportionality for the electoral systems: a measurement that is both realistic in capturing ‘the achievable proportionality’ and immune to distortions caused by the practical implementation of electoral systems. Further, we seek to use new data with better geographic coverage and an extended temporal observation window, and to avoid the pitfalls of previous studies that chose models that are not appropriate for use with panel data.

This chapter tries to advance the knowledge of the political economy of electoral systems by addressing some of the shortcomings and limitations of the relevant extant literature. We seek to do so in the following ways:

1. By distinguishing between the systemic disproportionality of the electoral systems and the empirical or manifest disproportionality. The methodology developed in the previous two chapters allows, for the first time to estimate models that measure electoral disproportionality independent of the outcomes of the electoral systems when they are put into practice in real elections. This opens the door to testing whether proportional system designs lead to proportional outcomes in practice or if changes in the proportionality of a system design can lead to changes in the (economic) distributional outcomes. Our proposed methodology allows to answer the question a-priori at the theoretical level (i.e., without resorting to the outcomes of real elections that often mask electoral disproportionality).
2. By extending the scope of our panel to cover data from the 21st century in a large number of democracies in all major geographic regions of the world.
3. By explaining some of the conditions that need to be met before a theory can be established regarding the effect of the electoral rules and structures on economic distribution.

Against this background, we seek to answer three specific questions:

1. Is there a statistical relationship between the proportionality of electoral systems and the level of economic inequality between countries in a representative sample of all democracies worldwide?
2. Are there conditions that, if met, would allow us to hypothesise a causal path between electoral proportionality and the level of income equality in a world-wide cross-country comparison? and finally,
3. Is there an intra-country relationship between party diversification and change in the level of income inequality? And if so, is this relationship influenced by the stage of economic development?

Answering these questions will allow to provide empirical evidence about the validity of the intermediary mechanisms enumerated in chapter 2 (sec. 2.4.2) between electoral proportionality and net economic inequality.

The remainder of this chapter is organised as follows: to complement the second chapter, in section 6.2 we critically discuss the development of empirical literature on the fiscal outcomes of electoral systems. Section 6.3 presents the study's theoretical framework and hypotheses and provides theoretical justification for the choice of variables. Section 6.4 describes the sample and data sources. In section 6.5, we introduce our empirical models specified to test the research hypotheses. Section 6.6 presents and discusses the results. Section 6.7 concludes the chapter, showing the relevance of this chapter's findings in addressing the question of 'how' electoral systems impact economic redistribution and inequality (as introduced in chapter 2).

6.2 Literature review

The study of the policy impacts of the electoral systems has attracted considerable scholarly attention in the past two decades. Chapter 2 offered an in-depth review of the literature regarding the economic consequences of electoral systems. We know about the different mechanisms that drive the potential interaction between the attributes of the electoral systems and the redistributive policies of governments. We also know that almost all proposed theories assume a strong correlation between the type of electoral system and the level of redistributive outcomes.

Prior to developing our own theoretical model for the interaction between electoral designs and the distributional outcomes in section 6.3, we will draw on the literature review conducted in chapter 2. We review the empirical findings of previous studies with regard to the (re)distributional impacts of the electoral systems. Table 6.1 summarises the design (models, variables) and findings of these studies.

As shown in Table 6.1, the first studies that sought to determine whether electoral systems affect the (re)distributional outcomes (the ‘if’ question), emerged in the late 1990s. Initially, this strand of research focussed on the impact that electoral systems had on public policy. Beginning with Persson and Tabellini (1999), scholars began to ask whether countries with proportional and majoritarian electoral systems differ on any of the following three aspects:

1. The size of the government (measured by the total or central government spending as a percentage of the GDP).
2. The level of social spending as a percentage of the GDP.
3. The way social spending is split between goods that are targetable to certain geographical constituencies, such as infrastructure programs (a.k.a., public goods, narrow goods, local goods), and those which are available to broad sectors of the society, such as free universal healthcare and education (a.k.a. subsidies and transfers, broad goods) (Raudla 2010).

Table 6.1

Summary of the empirical literature on the electoral determinants of social policy and economic inequality

Authors/Year	Sample (country - year observations)	Data Period	Models	Dependent variables	Independent variables	Controls	Effect
Persson & Tabellini 1999	35-54 country-year obs.	1988-92	OLS	Size of govt. as % GDP Broad goods	PR (binary)	Presidentialism	+/+
Persson & Tabellini 2001, 2003	Panel: 60 (~1400-1800 country-year obs.) CC: 85 (~250 obs.)	1960-98 1990-95	FE	CGS Broad goods	PR (binary)	Presidentialism, Region, Colonial history, Age, Democracy score, Gini	+/+
Milesi-Ferretti, Perotti, Rostagno 2002	19 LA (20 country-year obs.) 38 OECD & LA (40 country-year obs.) 19 OECD (112 country-year obs.)	1960-94 1991-94	OLS Shocks	TGS Broad Goods	PR (Rae index) PR (DM)	GDP per capita, % over 65 years, Region	Whole sample: Transfers (+) EU: transfers and SS (+) LA: no effect
Perotti & Kontopoulos 2002	17 OECD (362 obs.)	1970-95	OLS with year and country dummies	CGS	Size of the ruling coalition Cabinet size	Unemployment, Inflation	+
Scartascini & Crain 2002	22 OECD (569 country-year obs.) 106 (1018 country-year obs.)	1971-96 1980-96	FE	CGS Broad Goods	PR (binary) Political Competition (ENPP, parties, weighted parties)	Presidentialism, Federalism, Closed Lists, Seats in the lower chamber, percentage of seats held by the largest party, Majority party, GDP per capita, population, % over 65 years, Openness to trade, region	+/+
Mukherjee 2003	110 country-year obs.??	1978-96	FE	CGS Broad Goods	ENPP	Presidentialism, Federalism, Seats in lower chamber, Ideology, Democracy, Election, Majority party, GDP per capita, population, % over 65 years, Openness to trade, Region, Year	+/+
Crepaz & Moser 2004	15 OECD (459 country-year obs.)	1960-96	Pooled OLS with corrected errors	CGS SS	ENPP	Collective veto points, Competitive veto points, Bicameralism, Globalisation, Trade Openness, Capital deregulation, % over 65 years, Unemployment, Inflation, GDP per capita, % left cabinet, Oil exporter	+/+

(Continued)

Table 6.1 (Continued)

Authors/Year	Sample (Countries and Observations)	Data Period	Models	Dependent variables	Independent variables	Controls	Effect
Alesina & Glaeser 2004	20 OECD (20 country-year obs.) 18 LA (18 country-year obs.) 60 worldwide (60 obs.)	1960-98	OLS	SS	PR (DM)	GDP/capita, Trade Openness, % over 65 years, % pop. 15-64	+
Bawn & Rosenbluth 2006	17 European (447 country-year obs.)	1970-98	Panel: PCSE, FE, GMM	TGS	Number of Parties in govt. ENPP	Govt. ideology, Caretaker Govt., GDP per capita, Unemployment, Dependency ratio, Trade Openness	No effect
Persson, Roland, Tabellini 2007	Panel: 34 (140 country-year obs.) CC: 46	1960-98 1990-98	OLS, 2SLS, FE, GMM, Pooled OLS	CGS	PR (binary) PR (DM)	Coalition government	+
Lupu & Pontusson 2011	17 OECD (country-year obs. 70-300)	1969-2005	(see paper)	SS	PR (Gallagher index)	Voter turnout, Income ratios, Vocational training, Unionisation, Unemployment, Female labor, GDP growth, Globalisation	+
Funk & Gathmann 2013	Switzerland cantons (~1800-2600 country-year obs.)	1890-2000	DID	Broad goods	PR (binary)	Sub-national socio-economic and political indicators	+
Verardi 2005	28 (highly unbalanced panel)	1980-95	Pooled OLS	Gini (disposable)	PR (DM)	British legal origin, GDP per capita, Level of education, Democracy, Ethnic fractionalisation, Linguistic fractionalisation, Openness to Trade, % over 65 years	-
Feld & Schnellenbach 2014	13 OECD (39 country-year obs.) 70 (234 country-year obs.)	1981-98 1990-98	Pooled OLS	Gini (disposable income) Gini (market income)	Plurality Rule PR (binary)	Income, Education, Population, % over 65 years, % pop. 15-64% Presidentialism, Federalism, CGS, Central Government Revenues as Percentage of GDP, Ethnolinguistic Fractionalisation, Civil Liberties and Political Rights, Trade Openness, Age of Democracy	No effect
Murawski 2015	42 (281 country-year obs.)	1984-2013	Pooled OLS, FE	Gini (disposable income)	PR (Gallagher index)	Presidentialism, Semi-presidentialism, % over 65 years, Secondary Schooling, GDP per capita, Economic Openness	- (Pooled OLS) No effect (FE)

Note: **CC:** Cross-sectional, **CGS:** central government spending as % GDP, **TGS:** total government spending as % GDP, **SS:** Social Spending **PR:** electoral proportionality, **DM:** district magnitude, **ENPP:** the effective number of parliamentary parties, **LA:** Latin America, **FE:** Fixed effect, **DID:** difference-in-difference, **2SLS:** Two-stage least square, **GMM:** Generalised method of moments, **PCSE:** Panel-corrected standard error

Twelve of the studies listed in table 6.1 look only at the level of total government spending or social spending and, except for one (Bawn & Rosenbluth 2006), report a positive association with electoral proportionality. While valuable, these studies offered no insights on the consequences of the electoral systems on the market distribution of income (or wealth).⁸⁷ Hence, where they conclude that higher electoral proportionality would result in greater social spending or greater spending on universal goods, this conclusion does not necessarily imply that higher proportionality would lead to a more equal final distribution. This is because the studies do not check whether proportional systems allow for a more equal distribution prior to taxes and transfers. The three studies that consider the distribution of disposable income (Verardi 2005; Feld & Schnellenbach 2014; Murawski 2015) in fact show a different picture. According to these studies, either there is no relationship between electoral proportionality and income inequality in cross-country comparisons or there is a positive relationship.

Another shortcoming, especially of the older studies as is shown in column 6 of table 6.1, is that they use a binary distinction between proportional and majoritarian systems based on their theoretical attributes (e.g., district magnitude). Binary variables fail to capture the degree of electoral disproportionality and simply report its existence. Gradually, alternative continuous metrics were adopted to characterise the electoral systems; these include the Rae and Gallagher indices (Persson & Tabellini 1999; Persson & Tabellini 2001 and 2003; Funk & Gathmann 2013), various derivatives of the district magnitude (average, maximum, standard, etc.) (Milesi-Ferretti, Perotti & Rostagno 2002; Alesina & Glaeser 2004; Persson, Roland & Tabellini 2007) and formulas based on the number and relative sizes of the parties in the parliament or in government (Perotti & Kontopoulos 2002; Scartascini & Crain 2002; Mukherjee 2003; Crepaz & Moser 2004).

A separate problem with the aforementioned metrics⁸⁸ is that they take the election outcomes as the basis for their measurements. Because these outcomes are confounded with the effects of contextual factors as well as voters' behavioural adjustments to the electoral rules (see chapter 4 section 4.2), they fail to offer the necessary precision allowing a comparison of electoral systems.

The fourth shortcoming of the previous empirical studies is that they predominantly had a limited geographical breadth and used poor quality data. Early research was focused primarily on the OECD and the Latin American countries for which better data has been available traditionally about the profile of government spending. Only a few studies in the field have managed to extend their geographic scope to other regions in order to test the generalizability of their hypothesised theories on a global scale. These include Persson and Tabellini (2001 and 2003), Scartascini and Crain (2002), Mukherjee (2003), and Feld and Schnellenbach (2014).

From the mid-2000s, research started to focus on explaining the level of income inequality (rather than social spending) using electoral factors. One reason for the delayed appearance of such research was lack of quality and comparable data on economic inequality beyond the OECD countries and parts of Latin America, especially prior to the 1990s.⁸⁹ The most comprehensive among these new studies is the work by Feld and Schnellenbach (2014) that covers 70 countries with repeated observations over the period 1981-1998. The study controls

⁸⁷ Gross income, the distribution of income before taxation and redistribution

⁸⁸ except for district magnitude

⁸⁹ Data on the market distribution of income is even more restricted beyond the OECD countries

for a comprehensive list of socio-economic and political factors. Surprisingly, this research shows no association between more electoral proportionality and lower economic inequality but does not offer an explanation for this finding.

Lastly, the statistical models used by some empirical studies are questionable. The use of Pooled-OLS on panel data by Persson, Roland, Tabellini 2007, Verardi 2005, Feld and Schnellenbach 2014, and Murawski 2015 are the most notable examples. The pooled-OLS regression model removes the time aspect of the data and treats the sample as a set of comparable observations, ignoring all individually specific effects.

This research is intended to address in its analysis the five enumerated problems. The next three sections will introduce the hypotheses derived in relation to the main aims of the chapter and the variables and models used to operationalise and test those hypotheses.

6.3 Theoretical framework and hypotheses

To answer the first and second questions of the study, we want to know whether disproportionality measured by our proposed D_a index has been related to the level of income inequality in a representative sample of world democracies in recent years. In particular, we want to know whether disproportionality can have the predicted effect on income inequality when controlling for the effect of the effective number of parliamentary parties ($ENPP$) in the model. The answer to this question has important implications for assessing the arguments put forward in the literature about the impact of disproportionality on inequality (reviewed in chapter 2). If D_a is *per se* capable of explaining the cross-country inequality differentials, then coalition dynamics or universalistic decision-making hypotheses as proposed by the party-centred theories would not be as important as the voter-centred theories in explaining the causality between electoral disproportionality and economic inequality. However, if the number of parliamentary parties plays a significant role in explaining the level of inequality regardless of the level of disproportionality of the electoral system, then theories that rely on the degree of party diversification of the political system to explain policy outcomes, including economic inequality, would gain the upper hand. We, therefore, test the hypothesis that the effect of disproportionality on economic inequality is mediated by the effect of party diversification.

Hypothesis 1: Higher electoral proportionality is only associated with lower income inequality when it translates into a corresponding increase in the level of political diversification (i.e. increase in the level of political competition)

As shown by figure 6.1, the final profile of income inequality in every country is a result of the combined effect of initial distribution of created economic value (i.e., market income, gross income or pre-fisc income) and the level of government interference in redistribution through taxation and transfers (i.e. social spending).



Figure 6.1

Primary economic inequality vs. final inequality and the role of government redistribution

Many of the theoretical models that have been developed to explain the fiscal outcomes of the electoral systems, use government spending or public social spending as their dependent variables of interest (see chapter 2 and section 6.2). To answer the first question of this chapter from a different perspective, in our second analysis, we want to know which aspects of economic inequality may be explained by the electoral systems and their political consequences. This is done using the same between-effects model of the first analysis to estimate the effect of disproportionality on the market distribution of income and the level of change in Gini as a result of taxes and transfers over the 2010-2014 period. The goal is to compare the outcomes with the results of the first analysis to see whether the effect of electoral systems can be observed at the level of gross income distribution (initial inequality) or the level of change in initial inequality as a result of public social expenditure or only on the combined effects of the two (i.e. disposable income inequality). The hypothesis we test is:

Hypothesis 2: Higher electoral proportionality is associated with lower market income inequality as well as the level of reduction in equality as a result of government's redistributive policy.

Our third analysis addresses the second research question. The effective number of parliamentary parties is a determinant of income inequality in cross-country comparisons, whereas, according to the results that will be presented in section 6.6.1, the same proposition is not true about the level of electoral disproportionality. Since both factors are important characteristics of the electoral systems, this analysis is concerned with investigating the relationship between systemic electoral disproportionality and the effective number of parliamentary parties as a practical outcome of electoral systems. The two factors are predicted to be closely associated in theory (see Benoit 2006 for a review of the relevant literature).

For this analysis, we use a parsimonious fixed-effects regression model that controls for the age of the democracy and the interaction effect between the age of the democracy and the effect of systemic disproportionality, measured by the D_a index, on the level of diversification of the party system ($ENPP$). A better and perhaps more accurate alternative to controlling for the age of democracy in the model would be to use 'the duration of time since the latest electoral reform'. However, the construction of this variable requires access to the history of electoral reforms in every country. Without having access to the D_a figures for previous electoral systems in place, judging which reforms to consider as substantial would be a highly subjective exercise. We expect that in the older democracies, the relationship between the D_a index and $ENPP$ should be more in line with the theoretical prediction that greater systemic electoral proportionality (lower D_a) should result in higher party diversification.

Hypothesis 3: As democracies grow older, it is more likely that a negative and significant statistical relationship will be observed between the level of systemic electoral disproportionality and party diversification.

The fourth analysis is also intended to address the second research question and examines the longitudinal relationship between the party diversification and income inequality by utilizing fixed-effects and between-effects time-series models.

First, we study the relationship between electoral systems and economic inequality around the world over the past forty years. In the previous chapter, we offered the numerical calculation of the D_a index for all countries but only for their current electoral systems. This implies that our data for the D_a index is time-invariant and, in many cases, only valid for short time periods in the past because some countries occasionally have undergone electoral reforms during the period of interest (past four decades). Hence, unlike the limited longitudinal analysis that we conducted in the first and second analyses, the D_a index data cannot be included in models with longer time spans. Therefore, given that the relation between the D_a and $ENPP$ indices is studied in the third analysis, the fourth analysis takes $ENPP$ as its explanatory variable and tests the following hypothesis:

Hypothesis 4: Differences in the level of income inequality between democracies at various cross-sections in time over the past four decades and in a global sample may be partially explained by the differences in their level of party diversification.

Finally, in our fifth analysis, we study the within-subject relationship between the *Gini of disposable income* and $ENPP$ over time to determine whether variations in the effective number of parliamentary parties over time can partially explain the variations in the level of income inequality of a country. We also intend to discover whether the effect of party diversification on inequality is moderated by the level of development in a country. This analysis tests the following hypothesis:

Hypothesis 5: Over time, variations in the level of income inequality within democracies may not be explained by changes in the level of party diversification. Still, the level of development can partially explain the strength of the relationship between party diversification and economic inequality within countries.

6.3.1 Variables

To answer the three central questions of this chapter, we rely on both cross-sectional and longitudinal analyses. Both groups of regression models study the relationship between electoral disproportionality and the effective number of parliamentary parties ($ENPP$) as their independent variables, and inequality of income as the dependent variable controlling for a set of socio-economic structural or behavioural control variables. Throughout this chapter, income inequality is taken as the common proxy for the broader concept of economic inequality which also includes the distribution of wealth and assets. This has not been a matter of choice but rather one of necessity because good quality time-series data on the distribution of wealth has not been produced.

Control variables used in our various models include exposure to globalisation, presidentialism, federalism, level of corruption and the level of economic development measured by a variety of indices, including GDP per capita adjusted by purchase power parity ($GDP(PPP)_{pc}$), the economic complexity index (ECI), and the human development index (HDI).

Before elaborating the models, we first give a theoretical background indicating the relevance of each of the above variables to the estimation of income inequality as per the existing literature.

The effective number of parliamentary parties (ENPP)

This variable is known as N or, alternately, as the acronym $ENPP$ in the literature, and is calculated by applying the Laakso and Taagepera (1979) formula to the number of seats gained by parties in every election:

$$N = \frac{1}{\sum_{i=1}^{parties} s_i^2} \quad (6.1)$$

where s_i is the post-election fractional seat share of each party running in an election.

Unlike the actual number of parties in parliament, $ENPP$ is a measure of the relative strength of parliamentary parties and is always smaller than or equal to the former. For example, if a party gains 95% of the seats and five parties gain 1% each, the total number of parliamentary parties would be six but the effective number of parties is $ENPP = 1.1$, reflecting the fact that the weight of the larger party in bargaining and influencing the power relationships in the legislature is significantly higher than that of the other five parties.

$ENPP$ has been used in electoral studies as an empirical approximation for the level of disproportionality of the electoral system. Unlike many other empirical measures, the $ENPP$ is less prone to corruption by the behavioural adjustments of the voters and politicians to the expected consequences of the electoral rules. On average, proportional systems tend to enable more diversified political representation in the legislature compared to majoritarian systems in which the party system often gravitates towards a two-party structure. While this distinction is true for the typical proportional and majoritarian systems, in practice several factors complicate the relationship between proportionality of the electoral rules and the level of party diversification in parliament as a result of those rules.

Generally, proportionality is a necessary condition only for diversification of the party system and not a sufficient one. For example, in some post-colonial countries such as South Africa or Namibia where proportional systems were adopted after the transition to democracy, a single party has maintained its hegemony and dominated the political system ever since.

As another example, irrespective of the electoral system in place, a compartmentalised constituency can result in a high level of party diversification in parliament. Here, we are referring to the situation in which certain parties or groups of parties have mutually exclusive monopolies of representation in different electoral districts. In such circumstances, even a majoritarian system may be ineffective in reducing the number of parliamentary parties. Rather, the party orientations are more likely to be aligned with segmental interests instead of more universal interests represented by ideological parties of the left and right. Societies that are

segmented along various social cleavages such as race, faith, language and acute geographical imbalances in development, are cases in point. For example, in large countries such as India, regional interests have given rise to geographically entrenched parties that solely represent a single state or a few states. This situation corresponds with a higher number of parties in the legislature but does not necessarily imply a competitive electoral environment as would be the case under a proportional system.

The examples above illustrate some of the important factors that complicate the relationship between disproportionality and the effective number of parliamentary parties in the traditional way formulated by Duverger (1951), Lijphart (2003) and many others. The interaction between D_a (the index of systemic disproportionality) and $ENPP$ has been further scrutinised in this study in section 6.6.3 but at this point we need to remember that the two are not manifestations of the same thing but rather two associated variables albeit with complications.

The concept that can be captured by $ENPP$ with the highest precision is the level of *party diversification* of the political system. We avoid the common alternative expression '*party fragmentation*' because it may have a negative connotation, often implying that too many parties are represented in the legislature, which is deemed undesirable. Further, at times we refer to $ENPP$ as a measure of '*political competitiveness*'. Higher $ENPP$ may also indicate an uncompetitive compartmentalised electorate as mentioned above; empirically, however, most of the countries in our sample with diversified party systems are not cases of compartmentalisation. Hence, we acknowledge that any association between party diversification and political competitiveness is valid only at the statistical level.

Beyond being an indicator of electoral disproportionality, larger $ENPP$, which is indicative of higher parliamentary fragmentation, can also imply a more fragmented cabinet; i.e., a more divided ruling coalition. So, studies conducted to understand the implications of executive fragmentation on government decision making, such as the works of Scartascini and Crain 2002, Mukherjee 2003, Crepaz and Moser 2004 and Bawn and Rosenbluth 2006 (see chapter 2), sometimes consider $ENPP$ as a close associate for the level of competition within the ruling coalition, especially when data on the latter is not available.

Presidentialism and Federalism

Presidentialism, bicameralism and federalism are the three political factors that are frequently mentioned in the literature on the political economy of public spending and economic inequality (Persson and Tabellini 1999, Persson and Tabellini 2001, 2003, Scartascini and Crain 2002, Mukherjee 2003, Feld and Schnellenbach 2014, Murawski 2015). These three structures that may be found either jointly or individually in a country's political system create a situation known as a *power split* whereby institutions of the state are in conflict with each other and compete for popular representation.

Power split results in the creation of veto points in the structure of the state that often serves to maintain the status quo and make the system less responsive to change in the balance of public preferences in regard to policy matters. Indications of this problem include: institutional warfare between the opposing bodies (e.g., president and the legislative, different chambers within the legislative, etc.), unilateral attempts by the opposing branches of the state to push

ahead with their programs despite opposition from the other parties, policy gridlock, higher rent seeking and pork-barrel spending, and higher budget deficit (Cox and McCubbins 1997). This situation has two implications for social spending and economic inequality. On the one hand, the state's internal conflict prevents the voters (and especially the median voters) from being able to clearly assess each party's contribution to the conflict in policy outcome. This, in turn, would either undermine the ideological character of the political system causing it to drift towards more cronyism and personal vote in the normal situations (Cox and McCubbins 1997) or it can lead to greater party polarisation during periods of socio-economic crisis.

On the other hand, as explained by Persson, Roland and Tabellini (2000) and Persson and Tabellini (2004), in parliamentary systems "a stable majority of legislators pursue the joint interests of its voters. Spending thus optimally becomes directed toward a broad majority of voters, as in the case of broad social transfer programs or general public goods. In presidential democracies, the (relative) lack of such a majority instead pits the interests of different minorities against each other for different issues on the legislative agenda. As a result, programs with broad benefits suffer, and the allocation of spending favours minorities in the constituencies of powerful officeholders" (2004, 93).

Crepaz and Moser (2004) defined the power split situation as 'competitive veto points' as opposed to 'cooperative veto points' under a unitary power structure (see section 2.3.3.1). After examining 15 OECD countries between 1960 and 1996, they concluded that public expenditure is significantly and negatively affected by the competitive veto points structure; while the opposite is true when there is no such representational conflict.

Becher (2012) analysed a sample of 78 democracies highly representative of all regions of the world except sub-Saharan Africa between 1978 and 2002 to test the relationship between presidentialism and taxes and transfers. Through a series of regression analyses on cross-sectional and (unbalanced) panel data, he showed that presidentialism is negatively related to economic redistribution. He further argued that, unlike the proposals in previous literature, the reason behind this is not that presidential systems are more capable of controlling rent-seeking politicians. Rather, it is because presidentialism reduces the occurrence of left wing governments.

Unlike a majority of the research, some of which was cited above, some scholars dispute the significance of power split for social policy. For example, in his statistical modelling of 18 OECD countries between 1961 and 1994, Jose Aleman (2011) found that neither presidentialism nor federalism has a significant effect on either the Gini index of net income or the level of government redistribution controlling for a multitude of micro and macro-economic factors.

In the case of federalism, conflict between multiple tiers of government replaces the intra-branch power split. At the same time, in federal states, depending on their authority relative to the central government, local states may become competitive when appealing to the capitalists in order to repel the immigration of potential inter-state recipients of welfare services. Both of these moves are intended to limit the level of welfare spending at the local level and are known to be detrimental to economic equality (Feld and Schnellenbach 2014). Altogether, 11 countries in our sample (12%) use the federal system. Where relevant, a dummy for federalism has been included in our analyses.

Lastly, regarding bicameralism as mentioned in chapter 5 (section 5.4), because it is theoretically challenging to define electoral disproportionality in bicameral systems, cases of strong bicameralism with opposing electoral systems for different chambers are excluded from our study.

The level of socio-economic development

The relationship between economic development and income inequality has been a core issue for political economy since the mid-20th century. The seminal work of Simon Kuznets (1955) was one of the cornerstones of this scholarly endeavour. In this work, Kuznets studied the growth path of the US, Britain and Germany to trace the trajectory of economic inequality over the course of their development in the first half of the 20th century, concluding that there is an inverted U-shape relation between the two. Kuznets maintained that the initial stages of development that released peasantry into industrial wage labour caused the income inequality to increase. Later on, as labour became organised to claim more of its share from economic value production, inequality decreased to historical lows. This golden age continued for another two decades in the industrial world before a regression in the 1980s undid part of those achievements. “As data on changes in inequality over time have accumulated for many more countries, however, it has become apparent that the inverted-U relationship hypothesised by Kuznets does not hold in general” (Ferreira and Ravallion 2009).

This largely has to do with the different trajectories taken by developing countries through the course of their development in recent decades. We are now witnessing various relationship patterns between the two factors in developing countries depending on their exposure to globalisation, the position they occupy in the global division of labour and production chain, and the pace and pattern of growth they experience.

Medium income countries in Latin America have generally experienced a persistent and high level of inequality regardless of the economic development achieved in this region over the past three decades. African countries are less developed and less economically unequal except on the southern tip of the continent. This much seems to be aligned with the Kuznets assertion. However, Eastern European economies that initially enjoyed lower inequality inherited from their period of engagement with the 20th century socialism continued to experience a steady increase in inequality as they developed further without any retreat in the later stages (at least so far). Overall, “the evidence from the available cross-section of developing countries suggests that there is little aggregate tendency for these inequality levels to fall with economic growth” (Ferreira and Ravallion 2009). “What the Kuznets inverted-U demonstrates, then, is historically what on average did happen for a group of nations at one point in time. It does not imply that all countries, especially late developers, must necessarily tolerate or even promote increasing inequality to achieve economic growth over time” (Cypher and Dietz 2009, 60).

Yet, as Ferreira and Ravallion acknowledge, the pace of changes in income inequality within countries has been such that at every cross-section in time we can still see a clear negative correlation between the average levels of inequality of countries and their level of development. And although the intra-country relationship may not follow Kuznets’ prediction (Cypher and Dietz 2009, 59), there is a strong cross-country relationship between the two variables that, as yet, has not been influenced by the divergence in the intra-country trends of development.

Political corruption

A less likely candidate for the measurement of economic development is corruption. Political corruption is a variable known to be associated with economic inequality. In their study of a cross-section of 38 countries collected between 1980 and 1997, Gupta, Davoodi and Alonso-Terme (2001) found a statistically significant and robust relationship between corruption and income inequality. They proposed several channels of influence between corruption and economic inequality, including biased tax systems and social spending in favour of the high income class, hampered growth, poor targeting of social programs, high concentration of asset ownership, lower social spending capacity due to tax evasion, and higher cost of running the government.

Adams and Klobodu (2016) studied an unbalanced panel of 21 Sub-Saharan countries between 1985 and 2011 and found that control of corruption and transparency in governance have been significantly and negatively related to income inequality measured by the Gini index. Similar studies confirm the same conclusion at international and intra-national levels. Apergis et al. (2010) and Dincer and Gunalp (2012) reported a positive and statistically significant relation between corruption and income inequality among the 50 states of the United States. Furthermore, along with some others, Apergis et al. claimed that this is a bidirectional relationship and, as corruption causes inequality to increase, inequality can promote corruption among those who have access to greater wealth (also see You and Khagram 2005).

While a majority of studies come to a similar conclusion about the relationship between corruption and inequality, a few present findings to the contrary. For example, Andres and Ramlogan-Dobson (2011) studied 19 Latin American countries over a 20-year period from 1982 to 2002 and discovered that the proposed relationship does not hold in that region. This may also be inferred from graph 6.1 that depicts the relationships between per capita GDP and corruption in three different continents. Here too, Latin America appears to be an exceptional region in which the abovementioned correlation is weaker than in either Europe or Africa. Since corruption and per capita GDP are highly correlated, one may conclude that the relationship between inequality and corruption is similarly weaker in Latin America compared to other parts of the world.

While Andres and Ramlogan-Dobson warn against drawing unwarranted conclusions, they hypothesise three ways in which greater corruption might contribute to the reduction of inequality. Those speculated mechanisms are explained below:

“First, there is a large informal sector in many Latin American countries that provides jobs and a source of income for people who are among the poorest in society. Many of these people lack the personal characteristics required to find work in the formal economy, while discrimination and institutional barriers also inhibit work opportunities... . Second, ... the provision of certain government projects, while fostering corruption, serves to improve the welfare of the very poor. Well-intentioned policy-makers are hesitant to reduce or eliminate corrupt programmes because this is often the only way to improve the condition of the poor. And third ... is the possibility that as corruption becomes more organised, the provision of some government goods may improve, thus contributing to improving the wellbeing of the poor” (Andres and Ramlogan-Dobson 2011, 972).

Finally, Gyimah-Brempong and Munoz de Camacho (2006) show that the strength of the corruption-inequality relationship varies across world regions. Unlike Andres and Ramlogan-Dobson, they identify Latin America as the region with the strongest relationship between corruption and inequality.

Despite the fact that both the level of development and corruption are cited in the literature as determinants of economic inequality, our data shows that the two variables are greatly confounded (correlation > 0.8, see Table 6.2). Figure 6.2 maps the corruption perception index (CPI) against per capita GDP in Europe, Latin America and Africa. Combined, these three regions account for more than 82% of the cases in our sample.⁹⁰

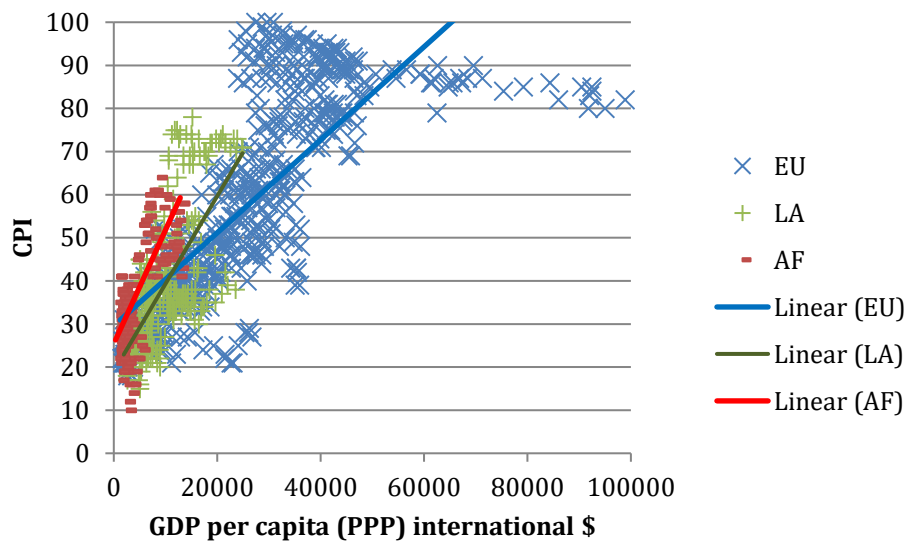


Figure 6.2

Relation between the level of economic development and corruption

($R_{EU}^2 = 0.5993$, $R_{AF}^2 = 0.5569$, $R_{LA}^2 = 0.4699$)

Figure 6.2 indicates that the correlation between CPI and economic development measured by GDP per capita is strong in Europe and Africa and still considerable in Latin America.

To avoid conflation of the error terms, we do not use CPI and the group of variables reflecting the level of development in the same model; instead, we take it as an alternative proxy for development. The proxies mentioned above for the level of development will be used as substitutes in robustness tests in some of our models as substitutes.

Globalisation

Extensive research has been carried out on the impact of globalisation on economic inequality. Nonetheless, it is one of the most controversial and unsettled debates among scholars in the field. The most common quantifier of globalisation is the level of international trade relative to the size of gross domestic production. There is no conclusive support for a linear and omnipresent relationship between the level of trade and economic inequality. Some authors contend

⁹⁰ Note that higher CPI indicates less corruption.

that globalisation boosts the economy of the trading partners, thereby producing the revenue necessary to set up or expand the welfare systems. Others highlight the increase in international competition for foreign capital and argue that the ensuing race to the bottom in lowering wages and taxes depletes the domestic resources for the provision of social services (see Crepez and Moser 2004).

Despite the ambiguity, further probes have revealed micro effects observable at different levels of development based on the profile and composition of trade or the structure of the labour force. For example, Meschi and Vivarelli (2007) argue that trade between middle income and developed partners exacerbates inequality within the weaker country because only certain segments of the latter's economy are benefitted as a result.

6.4 Sample, variables and data

6.4.1 The Sample

In the previous chapter, we simulated electoral disproportionality for 92 democracies. Case selection was based on a set of criteria explained in section 5.2. The assessment of the quality of democracy has a somewhat qualitative nature; hence, there is no general agreement among different measurement sources as to whether a country at a certain point in time may be called democratic or not. However, as indicated by table 5.1 the 92 countries in our sample are in excess of 70% of the countries labelled 'free' or 'partly free' as of 2015 based on various indices of democracy. In this chapter to the extent that our data on variables allows we have included as many of these countries in our analyses as possible. Beyond simply being representative, this implies that the sample is nearly comprehensive and identical to the population of democracies. The sample to population ratio quoted above is relatively constant throughout the period covered in this study.

Longitudinal modellings in this chapter span the period from 1978 to 2014. Although data on some of the variables is available for longer periods for a number of countries, we limited the analyses to the above period because prior to 1978 there are less than 20 observations per every cross-section which can significantly unbalance the panel and limit the degree of freedom of models even with a few independent variables.

From the 92 countries included in this study, 27 are members of the Organisation for Economic cooperation and Development (OECD). Of the remaining 65 countries, 10 are in Asia, 18 in sub-Saharan Africa, 13 in Eastern Europe and Eurasia, 22 in Latin America and 2 in the Middle East.⁹¹ Expansion beyond the OECD and Latin America allows a thorough investigation of the relations hypothesised in the previous research about the interaction between electoral systems and economic inequality.

⁹¹ Turkey is reported both as a Middle Eastern country and a member of the OECD

6.4.2 Operationalisation of the variables and data sources

Systemic electoral disproportionality

In chapter 4, we explained the distinction between systemic and empirical measures of electoral disproportionality and introduced the D_a index to capture the former concept. D_a was measured in chapter 5 for the most contemporary version of the electoral systems across 92 democracies. The data produced in chapter 5 will be used in this chapter as indicative of the systemic disproportionality of electoral systems.⁹²

Age of Democracy

The age of democracy is measured for all independent countries using the democracy index produced annually by Freedom House since 1972, and Polity IV Project scores for 1800-1972.⁹³ In the former case, the index ranges from 1 to 7 with 7 indicating the least democratic condition. A move to below 4.5 in this range is considered a transition to democratic rule. In the latter case, the index varies between 0 and 10 with 10 being the best score for democracy. Any score above 5 indicates a transition to democracy. Periods of four years or less of interruption to democratic rule due to a coup, civil war or foreign occupation as well as the two World War interregnums are not considered as transitions back to autocracy providing that democracy is restored immediately afterwards.

Effective number of legislative parties (ENPP)

ENPP is calculated for all countries in the sample and all elections during the democratic periods between 1919 and 2016 as per the criteria used to construct the 'Age of democracy' variable. The ENPP value attributed to years between two elections is equal to the value of ENPP produced by the election outcome at the beginning of the period. This means that MPs' resignations and their defections during the period of a parliament are not covered by the data. ENPP is not calculated in the case of the Solomon Islands due to the extreme fragmentation and non-partisan nature of politics in this country where the legislature is dominated largely by the independents.

Income Inequality

The most common index for skew in economic distribution is the Gini index. Because there is no consensus regarding the construction of distribution data (UNU-WIDER 2014), this index is reported in different sources using different definitions of distribution. The two main factors influencing the measurement of the Gini index are (a) the welfare definition used: whether income is measured on the basis of consumption or earning; and (b) the equivalence scale

⁹² The closest competitor to D_a in the literature is the notion of district magnitude (i). Like D_a , DM can be measured solely by referring to the legal structure of the electoral systems independent of their empirical consequences. In the concluding section to this chapter we discuss the advantage of using D_a over DM .

⁹³ These indices are introduced in detail in chapter 5 section 5.2

applied: whether the measurement unit is individual, household or equalised household (household size adjusted by the number of adults and dependents within it).

In most of the developed countries, net and market income are the basis for the measurement. In developing countries where income data is not as widely available or of good quality, consumption figures are used to calculate the Gini index. The use of consumption figures is problematic and, aside from other methodological issues, results in an overall underestimation of inequality because high income individuals (or households) are more likely to own the means of production compared to low-income individuals (or households).

Furthermore, the measurement unit is another important factor in the measurement of inequality. The simplest but least accurate unit of measurement is the household when not adjusted for variations in its size. Different equivalence scales are used by different measurement sources which reduces the comparability of the estimates (UNU-WIDER 2014).⁹⁴

The comparability problem has been a main factor restricting the sample sizes in previous research on the political economy of electoral systems. To overcome this restriction, we adopt a standardised dataset of Gini figures called The Standardised World Income Inequality Database (SWIID). We use the most recent version of this dataset (version 6.0 released in July 2017). This edition involves around 5000 observations of 192 countries dating back to 1960. The SWIID dataset was first introduced in 2008 by Frederick Solt, an associate professor in the Department of Political Science at the University of Iowa.

The advantage of the SWIID methodology is that it avoids fixed adjustments that are often used to convert data from one source to another. Fixed adjustments fail to take into account cross-country and cross-time variations of the factors involving the calculation of the Gini index. For his standardisation process, Solt instead took the Luxembourg Income Study (LIS) dataset to generate model-based multiple imputation estimates of the missing observations in the data. All LIS observations are retained without change in the SWIID. In order to produce Gini index estimates that are LIS-compatible, he then categorised all existing data from multiple sources into 13 categories defined by the combinations of welfare definitions and equivalence scales used in their calculation. Then, using one-step and two-step prediction techniques, ratios between different sources of data are calculated for as many countries and years as possible. In every country, missing data in the adjacent years is produced by applying a five-year weighted moving average algorithm to the data regenerated 1000 times through Monte Carlo simulation. Through these steps, SWIID delivers estimates of LIS-compatible Gini index of net income in all country-years for which there is a Gini index in at least one of the 13 categories of the source data (Solt 2016, 1271-1275).

⁹⁴ For example:

Household per capita
Square root
OECD scale
Modified OECD scale

Household size
Household size ^{0.5}
 $1 + 0.7 \times \# \text{ of additional adults} + 0.5 \times \# \text{ of children}$
 $1 + 0.5 \times \# \text{ of additional adults} + 0.3 \times \# \text{ of children}$

The level of development

Four proxies are being used for measuring the economic development. These proxies are indices that are developed using very different methodologies to capture different aspects of the concept of development. The most common index used in this research is the per capita gross domestic product corrected for the differences in purchase power parity between countries based on the current international dollar as the unit of measurement (*GDP(PPP)pc*). The data source for this variable is the International Monetary Fund (IMF) and covers the period 1980-2016 with an annual frequency.⁹⁵ Because the IMF does not report GDP figures for Kosovo, data for this country is acquired from the World Bank data that uses a similar methodology.⁹⁶

The second index is the economic complexity indicator. This indicator was developed by a team at Harvard University's Center for International Development and is defined as a measure of "how diversified and complex a country's export basket is. Complexity is a measure of the knowledge in a society that gets translated into the products it makes. A country is considered 'complex' if it exports not only highly complex products but also a large number of different products. When a country produces complex goods in addition to a high number of products, it is typically more economically developed or can be expected to experience fast economic growth in the near future. Consequently, *ECI* can be used as a measure of economic development" (<http://atlas.cid.harvard.edu/about/glossary/>).

This variable has not been used in the previous research in the field and its use is at the same time a test of the quality of this recently developed data. It must be noted that because *GDP(PPP)pc* and *ECI* variables do not have a normal scale, in all our models they are normalised between countries in every time cross-section (i.e. in every year).

The third proxy is the United Nations' human development index. This composite index combines measurements comprising three dimensions: health measured by life expectancy at birth, knowledge measured by the average years of schooling per head, and standard of life measured by the gross national income per capita (PPP). As an alternative to approaches that take economic growth as the ultimate criteria for development, "the *HDI* was created to emphasise that people and their capabilities should be the ultimate criteria for assessing the development of a country" (<http://hdr.undp.org/en/content/human-development-index-hdi>).

Corruption perception index (CPI)

The *Corruption Perception Index* is a measure of corruption in countries' public sector. It is a composite index constructed by averaging corruption-related data collected from various reputable institutions, and reflects the views of observers and experts living and working in the countries evaluated (Transparency International 2015). *CPI* is normalised to 100, with this maximum value representing a corruption-free public sector. The annual *CPI* data is available for 1998 to 2016 for all countries investigated in this research. However, five countries - Fiji, Solomon Islands, Maldives, The Bahamas, Belize, and Kosovo - are greatly under-represented in

⁹⁵ <http://www.imf.org/external/datamapper//export/excel.php?indicator=PPPPC>

⁹⁶ <http://api.worldbank.org/v2/en/indicator/NY.GDP.PCAP.PP.CD?downloadformat=excel>

the dataset (>60% missing data) and another 13 countries have between 30% and 60% missing data.

Presidentialism

Presidentialism data is based on Robert Elgie's class categorisation of democratic regime types (for details see <http://www.semipresidentialism.com/>). The theoretical framework for this categorisation is adopted from Shugart and Carey (1992). In the increasing order of separation between the executive and legislative powers, these four categories include:

1. Parliamentary (42 countries in the study sample)
2. Premier-presidential (10 countries in the study sample)
3. President-parliamentary (9 countries in the study sample)
4. Presidential (29 countries in the study sample)

We add a fifth category to the above scheme to describe cases where a constitutional monarch with considerable powers presides over the political system. This category includes Bhutan (Ura 2013) and Morocco (The Economist 2016) in our sample. We label this category as:

5. Constitutional monarchy with strong monarch (2 countries in the study sample)

Premier-presidentialism and president-parliamentary types of democratic regime are different forms of a broader category called semi-presidentialism in which elements of presidential and parliamentary systems are combined (Uhr 2006, 479).

A premier-presidentialism regime is defined by Shugart and Carey as a regime consisting of the posts of president and prime minister in which:

1. the president is elected by popular vote;
2. the president possesses considerable powers; and
3. there also exist a premier and cabinet, subject to assembly confidence, who perform executive functions (1992, 23).

On the other hand, in a president-parliamentary regime

1. the president is elected by popular vote;
2. the president appoints and dismisses cabinet ministers;
3. cabinet ministers are subject to parliamentary confidence;
4. the president has the power to dissolve parliament or legislative powers, or both (1992, 24).

A comparison of these two types shows that in the latter, the president has an extra power enabling her/him to dissolve the legislature; hence, such systems establish a stronger dualism of power (see Shugart and Carey 1992, chapter 8).

Presidentialism data is produced for the period 1978-2015. The data is ordinal and ranges from 0 to 4 with 0 indicting a parliamentary system with minimum conflict of representation between legislative and executive branches, and 4 representing constitutional monarchies with maximum veto points against the power of the legislature. As noted above, for most countries in our sample, we rely on the descriptive categorisation offered by Robert Elgie. Categorisation in

this source is done based on the letter of the constitutions. In some countries, however, presidential powers are not exercised in practice and the role has traditionally become largely ceremonial (e.g. Kosovo, Austria and Iceland). In such cases, we adjust Elgie's classification accordingly to reflect the power duality in the structure of the state as it exists in reality. In making these adjustments, we also benefit from the *prespow1* and *prespow2* indices of presidential power developed by Doyle and Elgie (2016). These two normalised indices are generated using "the comparative and local knowledge embedded in existing measures of presidential power by employing principal component analysis, together with the expectation maximisation algorithm and maximum likelihood estimation" (Doyle and Elgie 2016).

Table 6.2 summarises the descriptive characteristics of the dependent and explanatory variables used in this study.

Table 6.2

Descriptive characteristics of the variables

variable	time range	observations	min	max	mean	stdev	median	source
Gini (SWIID)	1960-2015	2480	10.2	79.1	36.5	9.8	35.8	Frederick Solt SWIID 6.0
Da	most recent electoral system	92	0.1	32	16.2	9.8	12.8	own calculation
ENPP	1919-2016	3652	1	19.227	3.256	1.765	2.796	various
Presidentialism	1978-2016	2670	0	4	1.30	1.33	1	Elgie & Doyle
Federalism	-	92	0	1	-	-	-	
Age of Democracy	1919-2016	92	0	240	46.43	51.03	25	Freedom House, Polity IV
GDP(PPP)pc	1980-2016	2152	337	98899	14252	13647	9564	IMF (Kosovo from WB)
HDI	1990-2015	1779	0.222	0.949	0.702	0.151	0.722	UN
ECI	1995-2015	1366	-2.741	3.252	0.242	1.101	0.098	Harvard-MIT
CPI	1998-2016	1514	4	100	46.941	22.061	39	Transparency International
Trade as % GDP	1960-2016	2345	9.00	379	72.96	41.70	66	The World Bank

Table 6.3 shows the correlation matrix of all independent and control variables. According to figures in the table, simultaneous use of economic development or the use of corruption perception index with either of these indicators must be avoided as it causes multicollinearity in the models.

Table 6.3

Table of correlations between estimators used in various models

	<i>da</i>	<i>enpp</i>	<i>i_imf</i>	<i>eci</i>	<i>hdi</i>	<i>trade</i>	<i>pres</i>	<i>cpi</i>	<i>age</i>	<i>fed</i>
<i>da</i>	1									
<i>enpp</i>	-0.295	1								
<i>i_imf</i>	-0.159	0.172	1							
<i>eci</i>	-0.214	0.159	0.75	1						
<i>hdi</i>	-0.174	0.137	0.788	0.804	1					
<i>trade</i>	-0.169	0.093	0.322	0.145	0.168	1				
<i>pres</i>	0.033	0.028	-0.38	-0.515	-0.393	-0.156	1			
<i>cpi</i>	-0.186	0.031	0.806	0.692	0.736	0.146	-0.513	1		
<i>age</i>	0.11	0.001	0.61	0.503	0.535	-0.106	-0.217	0.635	1	
<i>fed</i>	0.119	0.094	0.159	0.225	0.138	-0.252	0.013	0.101	0.429	1

6.5 Models

To test the first hypothesis, we fit a between-effects regression model over the brief period of 2010-2014. The between-effect or between-estimator model (BE) is an ordinary least-square regression of the time-averaged dependent variable on time-averaged regressors. In other words, the BE model makes estimates using the cross-sectional information in the data. Given the amount of data available for this period, the panel is only moderately imbalanced. Equation 6.2 describes the general form of fixed-effect models used in the first analysis:

$$Gini_disp_i = \beta_1 \overline{Da_i} + \beta_2 \overline{ENPP_i} + \beta_3 \overline{pres_i} + \beta_4 \overline{fed_i} + \beta_5 \overline{(dev)_i} + \beta_6 \overline{trade_i} + \alpha_i + u_i \quad (6.2)$$

The variable called *dev* in the equation is GDP per capita or one of the three other proxies enumerated for development and will be used alternately in robustness tests. u_i is the between-entity error term.

Models used to test the second hypothesis are also between-effect models and use the same time period as the model described by equation 6.2. These models are shown by formulas 6.3 and 6.4:

$$\overline{Gini_market_i} = \beta_1 \overline{Da_i} + \beta_2 \overline{ENPP_i} + \beta_3 \overline{pres_i} + \beta_4 \overline{fed_i} + \beta_5 \overline{(dev)_i} + \beta_6 \overline{trade_i} + \alpha_i + u_i \quad (6.3)$$

$$\Delta \overline{Gini_i} = \beta_1 \overline{Da_i} + \beta_2 \overline{ENPP_i} + \beta_3 \overline{pres_i} + \beta_4 \overline{fed_i} + \beta_5 \overline{(dev)_i} + \beta_6 \overline{trade_i} + \alpha_i + u_i \quad (6.4)$$

Equation 6.3 models the inequality of gross income ($Gini_{market}$) and equation 6.4 is a regression model to explain change in the level of income inequality as a result of government's redistributive functions. This dependent variable is closely related to the level of social spending that is used in several previous studies.

Formula 6.5 shows the fixed-effect regression model for testing the third hypothesis:

$$ENPP_{it} = \beta_1 Da_{it} + \beta_2 age_{it} + \beta_3 (Da_{it} \times age_{it}) + \alpha_i + e_{it} \quad (6.5)$$

age_{it} is the age of democracy at time t in country i and e_{it} is the within-entity time-dependent error term.

To conduct the fourth analysis, again a between-effect model is used although, unlike the second model, here we have to deal with unbalanced panel data. We limit the duration of analysis to 38 years (1980-2014). Formula 6.6 shows the model and its variables:

$$\overline{Gini_i} = \beta_1 \overline{ENPP_i} + \beta_2 \overline{(dev)_i} + \beta_3 \overline{pres_i} + \beta_4 \overline{fed_i} + \beta_5 \overline{trade_i} + \alpha_i + u_i \quad (6.6)$$

As part of this step, and to acquire a better understanding of the evolution of the relationship between economic inequality and party diversification, we also present the β_1 coefficient as a function of time through a series of year-by-year OLS regressions for the same variables over the period of study (equation 6.7). To save on the degree of freedom of the models (given their small N) and avoid conflation of error, we drop variables *trade* and *federalism* from these models given that they were not significant in the preceding BE model.

$$Gini_t = \beta_{1t} ENPP_t + \beta_{2t} (dev)_t + \beta_{3t} pres_t + \alpha_t + \epsilon_t \quad (6.7)$$

The t index denotes the year for which the regression model is run.

Finally, in our fifth analysis, we study the within-subject relationship between *Gini* and *ENPP* over time using a fixed-effect model as per formula 6.8:

$$Gini_{it} = \beta_1 ENPP_{it} + \beta_2 dev_{it} + \beta_3 pres_{it} + \beta_4 fed_{it} + \beta_5 (N_i \times (dev)_i) + \alpha_i + e_{it} \quad (6.8)$$

This model involves the same estimators as those of the previous model plus an interaction effect between the level of development and *ENPP* to test whether the effect of *ENPP* on inequality is moderated by the level of development in a country. A fixed-effect model allows for controlling the effect of unobserved and fixed attributes of countries by moving these effects to the error term. We use this model to determine whether variations in the effective number of parliamentary parties over time can partially explain the variations in the level income inequality of a country.

6.6 Results

6.6.1 Electoral systems and the inequality of disposable income

Table 6.4 presents the results of the models' estimations formulated by equation 6.2. The table includes seven models. The fourth of these is the main model. Models 1 and 2 show the effect of independent variables D_a and *ENPP* on the inequality of disposable income. Model 3 estimates the relationship between the dependent variable and political and economic control variables. Political controls involved are *presidentialism* and *federalism* and economic controls are the level of *economic development* measured by per capita GDP (PPP) and *the level of integration in global economy* measured by the percentage share of international trade from GDP. Models 5 to 7 are robustness tests using alternative definitions of development, including economic complexity index, human development index, and corruption perception index. D_a and *federalism* are the two time-invariant estimators in these models. Figures in table 6.4 (and all other results presented in this section) are standardised β coefficients.⁹⁷

⁹⁷ Because our dependent variable (*Gini*) acquired from the SWIID 6.0 has a multiply imputed structure with 100 imputations, we use STATA's *xt* package for all our panel data models in this chapter. One limitation of this package is that it does not automatically compose standardised coefficients and the *r*-squared measure. For panel models we calculate the average adjusted *r*-squared figures from a customised piece of code offered by the Institute for Digital Research and Education (UCLA) website. All variables are standardised before being fed into the models so all tables reflect beta coefficients. For OLS regressions reported in table 6.8, we use the *mibeta* tool developed for STATA to extract beta coefficients and the fit of the model.

Table 6.4

Systemic and empirical effects of the electoral systems on income inequality, 2010-2014

Estimates from between-effects (BE) regression models

	model 1	model 2	model 3	model 4	model 5	model 6	model 7
Dependent variable: Gini (disposable income)							
Da	0.170 (1.59)			-0.0597 (-0.59)	-0.0217 (-0.21)	-0.0675 (-0.62)	-0.133 (-1.12)
ENPP		-0.296** (-2.86)		-0.258* (-2.58)	-0.266* (-2.59)	-0.261* (-2.43)	-0.163 (-1.49)
Presidentialism			0.182 (1.81)	0.201* (2.05)	0.235* (2.26)	0.248* (2.40)	0.220* (2.03)
Federalism			0.0458 (0.44)	0.112 (1.06)	0.0191 (0.18)	0.0401 (0.37)	0.0369 (0.37)
GDP(PPP)pc			-0.419*** (-3.61)	-0.398*** (-3.50)			
CPI					-0.294* (-2.54)		
HDI						-0.280* (-2.35)	
ECI							-0.430*** (-3.75)
Trade			-0.0806 (-0.66)	-0.0474 (-0.40)	-0.164 (-1.44)	-0.169 (-1.43)	-0.263 (-1.68)
constant	-0.0279 (-0.26)	-0.0188 (-0.18)	-0.0936 (-0.96)	-0.0858 (-0.91)	-0.0221 (-0.23)	0.0624 (0.54)	-0.0488 (-0.49)
<i>N</i>	363	363	363	363	357	349	287
<i>Adj. R</i> ²	0.021	0.086	0.299	0.346	0.312	0.277	0.451

t statistics in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As was predicted, based on models 4 to 7 in table 6.4, electoral disproportionality has no statistically significant relationship with economic inequality. While the effect size is very small in all models, the direction of the relation is contrary to theoretical prediction in all but the first model where there are no controls. On the contrary and consistent with our prediction, the number of parliamentary parties is a statistically significant estimator of the level of income inequality. This effect is missing only in model 7 dwarfed by the effect of economic complexity on inequality. In models 4 to 6, results indicate that a standard deviation increase in the *ENPP* can reduce inequality by about 0.25 standard deviations on average.

Presidentialism is another statistically significant predictor with a similar magnitude of effect. Models 4 to 7 in table 6.4 show that presidential systems (with divided power) are more unequal on average compared to parliamentary systems (with unitary power structure).⁹⁸

All proxies for the level of economic development have strong correlations with the level of economic inequality. Every unit increase in income per capita reduces the Gini index by a standard deviation of 0.4. Integration in the global economy is, however, not a statistically significant estimator in either of the models in table 6.4. However, like federalism, the direction of its effect is in line with the theoretical predictions that greater exposure to global trade can reduce inequality.

⁹⁸ Further down, we will show that this effect was not present until the most recent decade (tables 6.7 and 6.8).

The modelling results presented in table 6.4 reveal that if electoral systems can have an impact on the level of income inequality, it is not a direct and systemic effect related to their level of disproportionality. Instead, political competitiveness is a consequence of the electoral system that is related statistically to income inequality. This outcome suggests the impact of systemic electoral proportionality on the level of economic inequality, and is conditional on the former being first translated into adjustment in the level of political competitiveness which manifests itself in the number of parties that can gain sizable parliamentary representation. The validity of this assertion will be further investigated in section 6.6.3.

The findings above support the first hypothesis. Once again, it must be reiterated that larger *ENPP* in some cases does not correspond with political competitiveness but rather could be a symptom of a compartmentalised electorate. Models that can control for this difference may result in more accurate estimations.

Figure 6.3 plots the average level of Gini against average *ENPP* for countries in the sample. While the direction of this relationship is negative, this figure shows that the fit of a linear model is very low (only 7%). This outcome is largely distorted by the impact of a few countries in our database: most notably Brazil and Colombia. Despite having a large number of parties in their parliaments, these two countries have experienced persistent levels of high income inequality over the past few decades. As shown in the same figure, the single exclusion of Brazil from the sample improves the fit of the regression line to 16%.

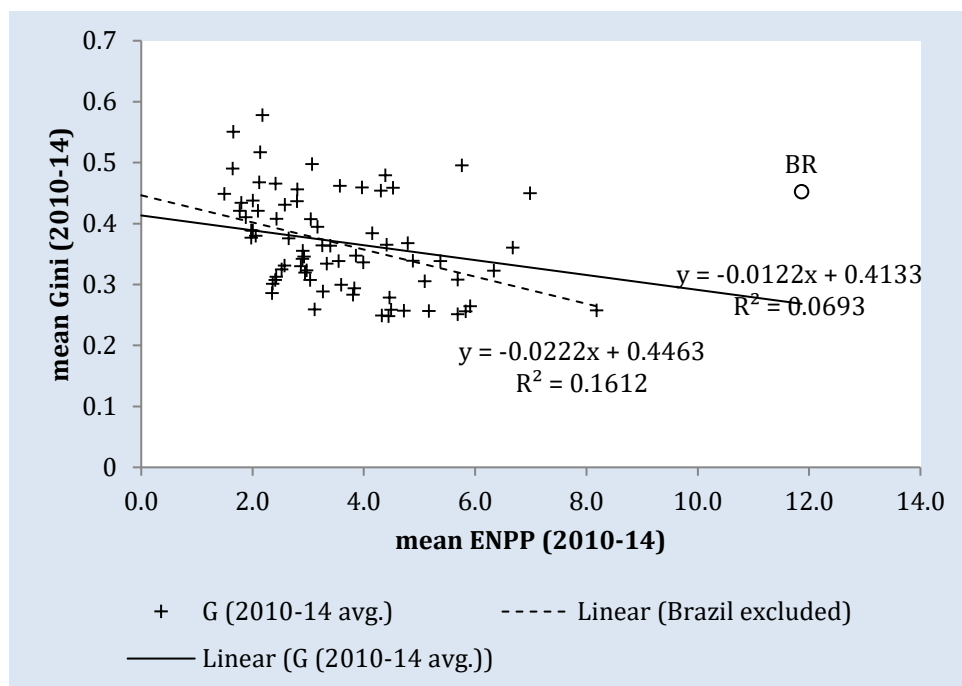


Figure 6.3

Average Gini plotted against Average effective number of parliamentary parties for 91 democracies (2010-14)

But why, despite the great political diversification, have these two countries experienced high income inequality over the study period (1978-2105)? A closer look at the intra-country variations in Brazil and Colombia reveals that in both cases an increase in the political

competitiveness (since the 1990s in Brazil and since the 2000s in Colombia) has coincided with a decrease in the level of economic inequality (figure 6.4). This effect is more stable in Brazil, while in Colombia the two variables are not as neatly aligned. Still, because the level of inequality was extremely high at the start of the period, in both cases, their current levels of inequality is still high compared to those of other countries with competitive party systems.

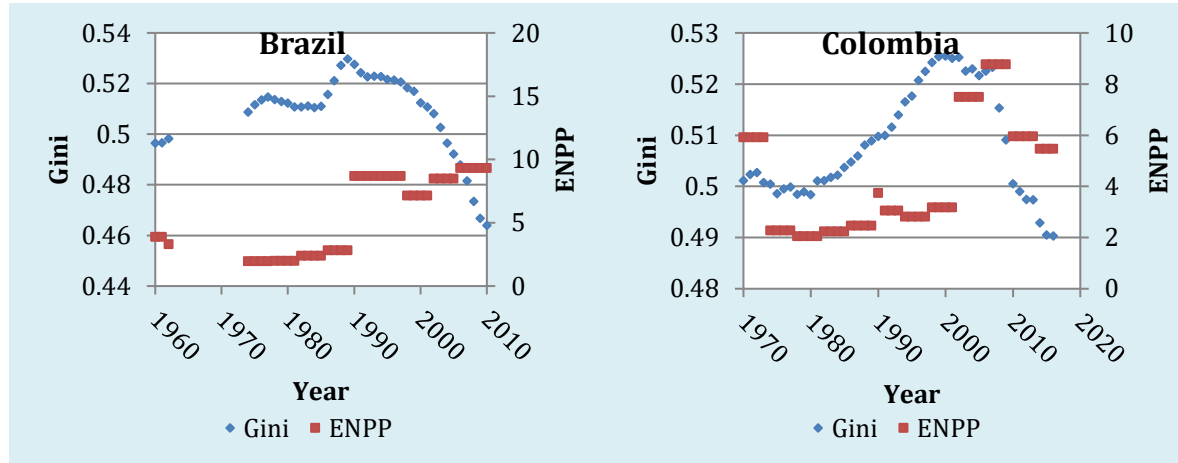


Figure 6.4

Trends of party diversification and economic inequality in Brazil (left) and Colombia (right)

6.6.2 Electoral systems and market inequality

In our second analysis, we simply want to determine whether the relationships (investigated above) between the disproportionality of electoral systems and the economic inequality of disposable income can also explain the difference in the level of market inequality and also the level of government redistribution through taxation and social spending between countries. For this purpose, we compare the results of three regression models (table 6.5 models 3, 6 and 9). Model 3 is a repetition of model 4 in table 6.4. Model 6 replaces the dependent variable with market distribution of income, and model 9 takes as its dependent variable the difference between market and disposable income as a proxy for the post-market interference of the state in the redistribution of income.

Table 6.5

The effect of electoral system on market and disposable income inequality, 2010-2014

Estimates from between-effects (BE) regression models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Gini (disposable income)		Gini (market income)		Absolute reduction in Gini due to taxes and transfers				
Da	0.170 (1.59)		-0.0597 (-0.59)	-0.0974 (-0.58)		-0.281 (-1.43)	-0.288 (-1.34)		-0.131 (-0.66)
ENPP		-0.235* (-2.56)	-0.258* (-2.58)		-0.0801 (-0.60)	-0.201 (-1.30)		0.0724 (0.56)	0.0157 (0.10)
presidentialism		0.195* (2.00)	0.201* (2.05)		-0.225 (-1.37)	-0.195 (-1.20)		-0.619*** (-3.83)	-0.605** (-3.68)
federalism		0.0968 (0.95)	0.112 (1.06)		0.129 (0.99)	0.198 (1.46)		-0.0370 (-0.29)	-0.00468 (-0.03)
GDP(PPP)pc		-0.390*** (-3.47)	-0.398*** (-3.50)		-0.360* (-2.10)	-0.354* (-2.10)		0.239 (1.42)	0.242 (1.42)
trade		-0.0466 (-0.39)	-0.0474 (-0.40)		-0.00229 (-0.02)	-0.0274 (-0.18)		0.0630 (0.42)	0.0513 (0.34)
constant	-0.0279 (-0.26)	-0.0829 (-0.88)	-0.0858 (-0.91)	0.337* (2.20)	0.573** (3.40)	0.516** (3.04)	0.219 (1.11)	0.0902 (0.55)	0.0636 (0.37)
N	363	363	363	166	166	166	166	166	166
Avg. Adj. R ²	0.021	0.299	0.346	.	0.052	0.089	0.024	0.484	0.475

t statistics in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

These models indicate that the Gini of market income (models 4 to 6) and the absolute reduction in Gini due to taxes and transfers (models 7 to 9) are not statistically related to the diversification of the party system. Instead, other factors, including the level of economic development and presidentialism, are better estimators of these outcomes. This implies that the effect of an increase in party diversification on government's redistributive policies is not decomposable between pre-market and post-market interventions, at least not among countries in our limited sample. However, it must be noted that data for market distribution of income has a remarkably more limited coverage compared to the data for disposable income. Of the 91 cases in our sample, SWIID 6.0 provides data on market distribution for only 34 countries and most of these (~70%) are European or OECD members with African, former-USSR and Asian countries being all but absent from the sample. When we ran model 3 on the same limited sample of models 6 and 9, it was revealed that the *ENPP* is not a significant estimator of the final inequality either. This means that our analysis results cannot conclusively support the second hypothesis on a global scale; neither does it confirm the hypothesis for the 34 countries for which data is available. The outcome is at odds with the findings of the studies introduced in section 6.2 that report a positive relationship between electoral proportionality and higher total government spending or social spending (Scartascini and Crain 2002, Mukherjee 2003, Crepaz and Moser 2004).

6.6.3 Capacity of the electoral systems for political competitiveness

According to theory, lower disproportionality should enable more parties to represent the voters in the legislature. But as was shown above (in table 6.4), the two variables do not have the same potential in explaining economic inequality. So, one might wonder why? To answer this question we use a fixed-effects model as per equation 6.5. This model regresses the effective number of parliamentary parties against the level of disproportionality, age of democracy (in years) and the interaction between these two variables. While a low disproportionality system is generally conducive to a higher number of parties in parliament,

this shift is not automatic and sometimes it takes years for these two variables to align. A fixed-effects model is able to measure the within-subject change in the abovementioned relationship while controlling for unobserved heterogeneity between countries. Given the potential delay in the adjustment of $ENPP$ to D_a , we have no theoretical reason to believe that there is a between-country statistical relationship between the two variables. This is also confirmed by the Hausman test result ($\chi^2(2)=25.38$, $\text{Prob}>\chi^2=0.0000$) for the random effects model.

For this model, we expand the time span from 5 to 10 years (2005-2014). Because we do not have accurate information about the date of recent electoral reforms, we may run the risk of missing changes in D_a for some units in the sample, thereby compromising the accuracy of the model. However, to the best of our knowledge, such electoral reforms either have not occurred during the period under survey, or else were not yet been implemented in elections during that period (e.g. Italy and Chile). Table 6.6 reports the results of our third modelling.

Table 6.6

The effect of electoral proportionality on the level of political competitiveness, 2005-2014

Estimates from Fixed-effects (FE) model.

	Model 1 ENPP
D_a	- (.)
Age of Democracy	0.0425 (0.08)
$D_a \times \text{Age of democracy}$	-2.038** (-2.79)
constant	0.0513 (1.51)
N	776
$\text{Avg. Adj. } R^2$	.0363

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As predicted, the model estimation results (table 6.6, model 1) show that the interaction effect between time and disproportionality is a statistically significant predictor of $ENPP$. Given that the age of democracy is highly related to the age of electoral reforms (as noted before, remarkable reform of electoral systems is a rare incidence), these outcomes imply that, with the passage of time, a party system adjusts to the capacity of the electoral system for party diversification. The fit of the model is very low (only 3.6%) which is not surprising given the limitations of the D_a data in our dataset, the brief period of study, and the fact that only one variable in the model is expected to explain the variation in dependent variables.

The reaction of $ENPP$ to the level of electoral disproportionality may be observed more clearly in the three panes of figure 6.5.

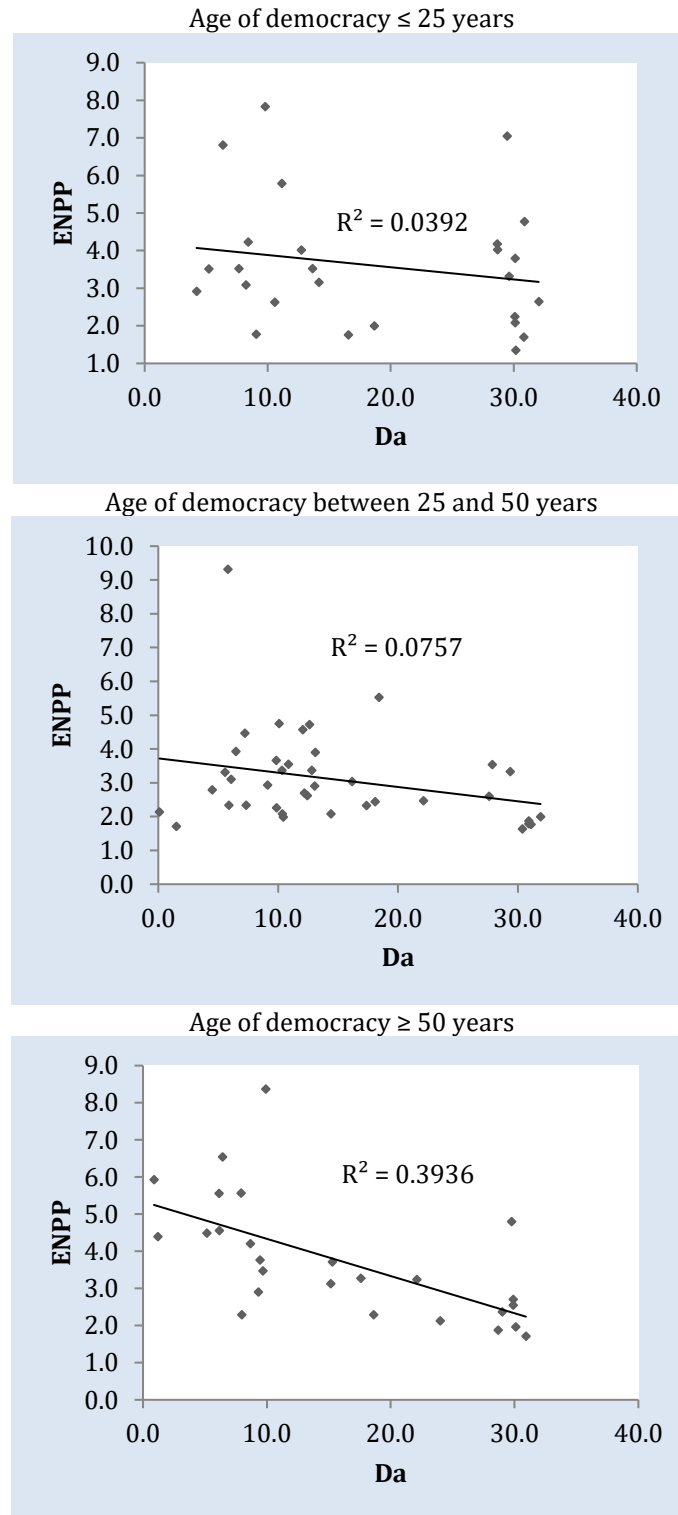


Figure 6.5
Relation between electoral disproportionality and the effective number of parties in parliament (2008-2015)

The panes in figure 6.5 separately illustrate the fit of the regression line between D_a and $ENPP$ for younger (<25 years), medium age ($25 \leq \text{years} < 50 \text{ years}$) and older democracies (≥ 50 years). As shown in the figure, the fit of the regression line increases from 3.9% in younger democracies to 7.5% in medium age democracies and jumps to 39% in older democracies. This

analysis confirms our third hypothesis about the delayed adjustment of party diversification to the level of disproportionality.

6.6.4 The long term interaction between ENPP and the Gini index

Our analyses so far have shown that the effect of electoral disproportionality on the level of income inequality is mediated by the level of diversification in the party system. In most cases, higher party diversification can be interpreted as an increase in political competitiveness. Based on this finding, we probe further into the long-term interaction between *ENPP* and income inequality to test the fourth hypothesis. As noted previously, long-term data on the level of electoral disproportionality is not available to us. Hence, in the remaining analyses in this chapter we investigate the quality of the relationship between *ENPP* as the independent variable and income inequality measured by the *Gini* index over the past 35 years (1980-2014). Although some data is available for the preceding two decades (1960-1980), the number of countries for whom this data is available is very limited, causing a very high imbalance in the panel data. For the survey period, panel size starts from 22 and increases to 82 with an average of 60 observations per panel.

First, we conduct a cross-country comparison of the effect of political competitiveness on market and post-redistribution levels of income inequality in our sample using a series of between-effect models as per equation 6.6. Table 6.7 summarises the results of this analysis. Variables used in this model are similar to models in table 6.5 except for the absence of D_a .

Table 6.7

The effect of political competitiveness on market and disposable income inequality, 1980-2014
Estimates from between-effects (BE) regression models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Gini (disposable income)		Gini (market income)				Absolute reduction in Gini due to taxes and transfers		
ENPP	-0.465*** (-3.87)		-0.375*** (-3.66)	-0.123 (-0.61)		-0.0420 (-0.22)	0.369 (1.74)		0.204 (1.25)
presidentialism		0.105 (0.94)	0.125 (1.27)		0.0236 (0.13)	-0.0470 (-0.26)		-0.508** (-3.20)	-0.492** (-3.26)
federalism		0.0233 (0.22)	0.0709 (0.69)		0.0544 (0.42)	0.0611 (0.45)		-0.0349 (-0.30)	-0.0728 (-0.64)
GDP(PPP)pc		-0.647*** (-5.91)	-0.565*** (-5.20)		-0.355 (-2.02)	-0.419* (-2.33)		0.259 (1.67)	0.251 (1.66)
trade		-0.00321 (-0.02)	0.0200 (0.16)		-0.0562 (-0.29)	-0.0353 (-0.17)		0.116 (0.68)	0.0721 (0.42)
constant	0.0655 (0.64)	0.0286 (0.32)	0.00615 (0.07)	0.172 (1.07)	0.365* (2.11)	0.423* (2.31)	0.0848 (0.50)	-0.0399 (-0.26)	-0.0521 (-0.34)
<i>N</i>	2168	2328	2074	1070	1056	1021	1070	1056	1021
<i>Avg. Adj. R²</i>	0.140	0.349	0.418	.	0.123	0.114	0.060	0.479	0.502

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As in the analysis reported in table 6.5, here too, the effective number of parliamentary parties is a statistically significant predictor but only of the inequality in disposable income, and confirms the validity of hypothesis 4. This effect, which also has a remarkable magnitude, is shown in model 3. According to this model, every 1 standard deviation increase in (normalised) *ENPP*, decreases the *Gini* index by 0.38 standard deviation. Among other estimators, GDP (PPP) per capita is another statistically significant estimator of income inequality with a sizable and

negative magnitude. None of the other variables in this model shows a significant effect on inequality of disposable income.

Also, neither market inequality nor the level of government intervention intended to reduce inequality can be explained by the level of political competitiveness. Yet again, these results must be used with caution because, similar to the analysis reported in table 6.5, models 4 to 9 use a smaller sample of only 34 countries. When model 3 is run on that sample, the effect of ENPP on Gini is, also, not statistically significant. Interestingly though, model 9 shows that presidential systems are considerably worse than parliamentary systems in economic redistribution which is in line with the literature on presidentialism. Again, models 4 to 9 do not contain enough information to confirm the second hypothesis on a global scale.

By time-averaging all variables, the between-effects model does not fully utilise the information embedded in the time aspect of the longitudinal data because this model is intended to estimate only the average effects over time. But in order to follow the time-trend of relationships between the variables, we need to compare all cross-sectional models to trace the variation in the beta coefficients and the fit of the model over time. So, in order to acquire a better understanding of the cross-sectional relationship between the number of parliamentary parties and income inequality, we re-run the previous model for every single year within the period under scrutiny. For reasons explained in section 6.6.1, Brazil is excluded from the models as an apparent outlier. Also, as explained in section 6.5, the variables *Federalism* and *Trade* are removed from the model because previous analyses did not show any significant impact of either of the two variables on the output. The models tested in this analysis use equation 6.7. Given the small sample sizes, especially in the early years of the period being studied, a reduction in the number of variables will help to decrease the estimation error of the model by saving on its degree of freedom. Table 6.8 presents the results of this analysis.

Table 6.8

Year-by-year OLS regression modelling of the impact of political competitiveness on economic inequality (1980-2014)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Dependent variable: Gini (disposable income)										
ENPP	-0.476*	-0.408*	-0.333	-0.276	-0.415**	-0.316	-0.358	-0.217	-0.382	-0.329
	(-2.45)	(-2.37)	(-2.00)	(-1.72)	(-2.96)	(-1.85)	(-1.99)	(-1.46)	(-1.99)	(-1.86)
presidentialism	0.226	0.229	0.244	0.274	0.179	0.14	0.231	0.231	0.132	0.121
	-1.46	-1.48	-1.63	-1.82	-1.31	-1	-1.62	-1.66	-0.92	-0.9
GDP(PPP)pc	-0.854***	-0.841***	-0.871***	-0.874***	-0.765***	-0.928***	-0.786***	-0.841***	-0.767***	-0.753***
	(-4.05)	(-5.07)	(-5.31)	(-5.41)	(-4.85)	(-6.19)	(-5.31)	(-5.92)	(-4.91)	(-5.23)
constant	-0.0141	0.0539	0.0407	0.0221	-0.163	-0.0118	-0.104	0.0463	-0.0661	-0.0312
	(-0.08)	-0.31	-0.24	-0.13	(-1.09)	(-0.08)	(-0.66)	-0.32	(-0.41)	(-0.21)
N	23	23	24	24	26	29	30	32	36	39
Adj. R ²	0.763	0.760	0.759	0.769	0.735	0.736	0.681	0.676	0.619	0.624

(continued)

Table 6.8 (Continued)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Dependent variable: Gini (disposable income)										
ENPP	-0.278 (-1.82)	-0.277 (-1.88)	-0.255 (-1.82)	-0.294* (-2.31)	-0.327* (-2.55)	-0.390** (-3.08)	-0.350** (-2.74)	-0.279* (-2.43)	-0.346** (-2.90)	-0.286** (-2.67)
presidentialism	0.157 -1.2	0.139 -1.09	0.0941 -0.7	0.13 -0.97	0.149 -1.17	0.147 -1.22	0.122 -1.01	0.133 -1.13	0.148 -1.3	0.133 -1.2
GDP(PPP)pc	-0.746*** (-5.59)	-0.701*** (-5.37)	-0.704*** (-5.42)	-0.664*** (-5.04)	-0.640*** (-5.04)	-0.612*** (-5.21)	-0.612*** (-5.22)	-0.615*** (-5.21)	-0.602*** (-5.21)	-0.604*** (-5.38)
constant	0.0125 -0.09	0.00568 -0.05	0.0359 -0.29	0.0643 -0.51	0.117 -1	0.0872 -0.8	0.0901 -0.84	0.0985 -0.92	0.122 -1.16	0.148 -1.46
N	42	46	51	59	65	69	71	72	71	75
Adj. R ²	0.611	0.573	0.528	0.453	0.466	0.478	0.461	0.441	0.474	0.454

(continued)

Table 6.8 (Continued)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Dependent variable: Gini (disposable income)										
ENPP	-0.285** (-2.82)	-0.306** (-3.01)	-0.213* (-2.26)	-0.230* (-2.18)	-0.236* (-2.41)	-0.271** (-2.97)	-0.255** (-2.88)	-0.218* (-2.57)	-0.200* (-2.37)	-0.204* (-2.34)
presidentialism	0.129 -1.2	0.129 -1.19	0.116 -1.04	0.119 -1.08	0.126 -1.15	0.15 -1.42	0.183 -1.76	0.173 -1.67	0.179 -1.76	0.181 -1.82
GDP(PPP)pc	-0.593*** (-5.43)	-0.568*** (-5.21)	-0.557*** (-5.07)	-0.547*** (-5.05)	-0.549*** (-5.25)	-0.501*** (-5.00)	-0.486*** (-4.89)	-0.464*** (-4.71)	-0.447*** (-4.48)	-0.421*** (-4.23)
constant	0.149 -1.51	0.166 -1.7	0.144 -1.47	0.138 -1.4	0.147 -1.52	0.11 -1.17	0.0785 -0.83	0.0401 -0.43	-0.017 (-0.18)	-0.0447 (-0.49)
N	76	78	81	81	81	83	81	83	82	83
Adj. R ²	0.458	0.447	0.391	0.377	0.386	0.383	0.396	0.371	0.363	0.361

(continued)

Table 6.8 (Continued)

	2010	2011	2012	2013	2014
Dependent variable: Gini (disposable income)					
ENPP	-0.270** (-2.96)	-0.298** (-3.04)	-0.307** (-3.12)	-0.306** (-3.42)	-0.210* (-2.47)
presidentialism	0.207* -2.15	0.254* -2.59	0.261** -2.69	0.379*** -4.03	0.454*** -4.73
GDP(PPP)pc	-0.389*** (-3.97)	-0.317** (-3.24)	-0.326** (-3.39)	-0.236* (-2.59)	-0.225* (-2.42)
constant	-0.0704 (-0.78)	-0.181* (-2.04)	-0.181* (-2.06)	-0.275** (-3.32)	-0.349*** (-4.23)
N	81	74	73	68	62
Adj. R ²	0.386	0.421	0.432	0.514	0.544

t statistics in parentheses
 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

According to the 35 models presented in table 6.8, the statistical effect of *ENPP* in the model was significant in the early years of the 1980s and then again continually since 1993. This is around the time when more than 20 new sovereign states came into existence mostly in the territory of the Soviet Union and Yugoslavia following the fall of the Eastern Bloc. Interestingly however, the magnitude of *ENPP*'s effect in explaining inequality has been in decline throughout the study period up until 2010 when it began to increase once more.

Another important predictor in these models is GDP(PPP) per capita as a proxy for economic development. While having a very sizable effect magnitude especially at the beginning of the period, the effect of this factor has continued to decline since. Conversely, in the last five years of the study period, presidentialism has started to gain significance in the models as an explanatory variable.

As a result of the above developments, the fit of the models tested here decreased between 1985 and 2010 before experiencing a modest rebound after 2010 (figure 6.6). The rebound may be attributed to the increase in the importance of presidentialism as an explanatory factor.

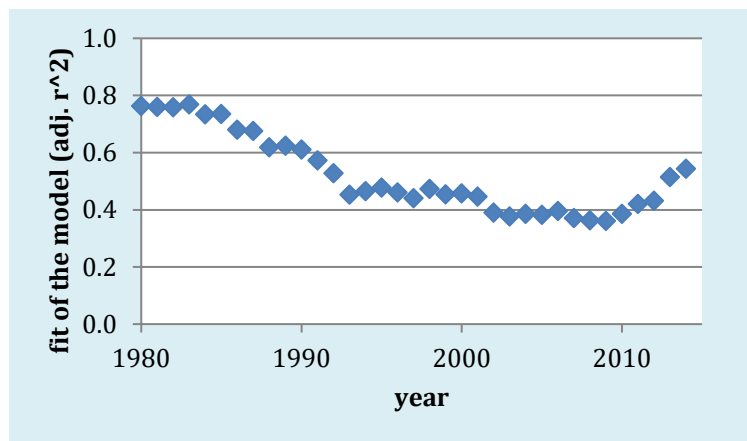


Figure 6.6

Fit of the regression models of Gini on *ENPP*, GDP and presidentialism

Note: beta coefficient for *ENPP* is significant in all years except 1987, 1989-93 and 2014-15.

Figure 6.7 shows the trend of change in the strength of the correlation between *ENPP* and *Gini* (of disposable income) between 1977 and 2014. The fitted line on the graph shows a sharp decline in the strength of the relationship between the two variables during this period. The dark grey points show the strength of the relationship when Brazil is excluded from the data. This manipulation shows a significant improvement in the strength of the relationship of interest after the mid-1980s and even indicates a rebound since the mid-2000s.

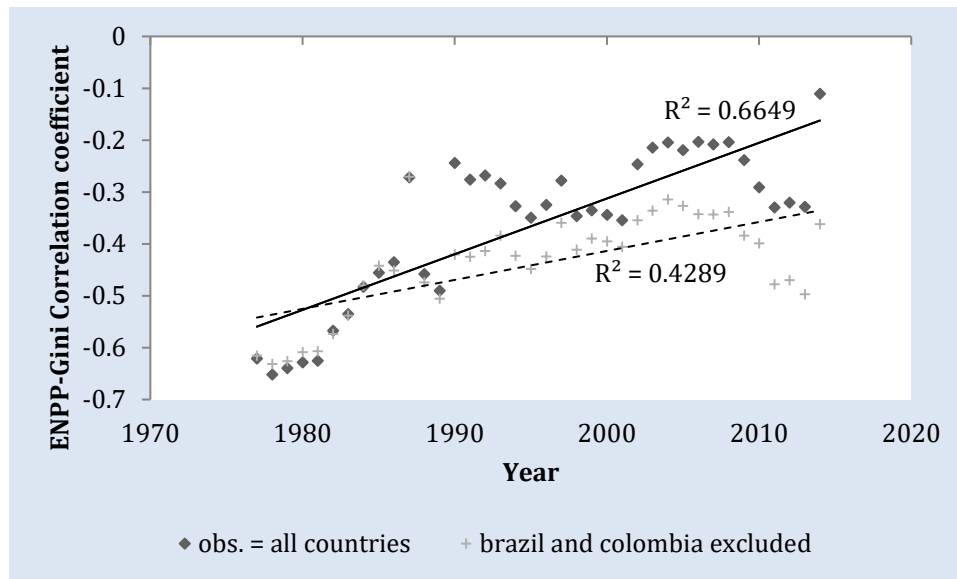


Figure 6.7

Evolution of ENPP-Gini relation over the period 1977-2014

Note: vertical axis is in inverse order.

6.6.5 Relation between ENPP and Gini through the stages of development

Finally, we test the fifth hypothesis concerning the intra-country impact of the economic development on the relationship between political competitiveness and economic inequality over time since 1980. Here, we address two questions:

- Have *ENPP* and Gini have been in an inverse relationship within countries throughout the period under study as implied by our theoretical analysis?
- Does the stage of development have an impact on the strength of the (Pearson's) correlation between *ENPP* and Gini within countries?

To answer these questions, we use a series of fixed-effects models as per equation 6.8. These models use the same variables as those in the models of table 6.7 in addition to the interaction effect between the effective number of parliamentary parties and the degree of development. Models 1 to 3 in table 6.9 present the estimation results. Models 4 to 6 present the robustness tests for alternative indices of development.

Table 6.9

The effect of political competitiveness on disposable income inequality, 1980-2014

Estimates from fixed-effects (FE) regression models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Dependent Variable: Gini (Disposable income)						
ENPP	0.0265 (1.68)		0.0285 (1.88)	0.0220 (1.27)	-0.225* (-2.26)	0.00366 (0.09)
Presidentialism		-0.108 (-1.75)	-0.107 (-1.75)	-0.165* (-2.49)	-0.0802 (-1.15)	-0.202** (-2.67)
GDP(PPP)pc		0.268** (3.13)	0.231** (2.78)			
ENPP × GDP(PPP)pc		0.0754 (1.58)	0.103* (2.28)			
ECI				0.126* (2.12)		
ENPP × ECI				0.0237 (0.54)		
HDI					-0.173* (-2.05)	
ENPP × HDI					0.308** (2.67)	
CPI						-0.0396 (-0.60)
ENPP × CPI						0.0444 (0.60)
trade		0.0224 (0.86)	0.0190 (0.73)	0.0178 (0.45)	0.0686* (2.35)	-0.0117 (-0.32)
constant	-0.0352* (-2.57)	-0.0414* (-2.19)	-0.0384* (-2.06)	0.0277 (1.06)	0.0862* (2.53)	0.0267 (1.14)
<i>N</i>	2168	2074	2074	1223	1704	1175
<i>Avg. Adj. R²</i>	0.003	0.047	0.050	0.026	0.019	0.014

t statistics in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

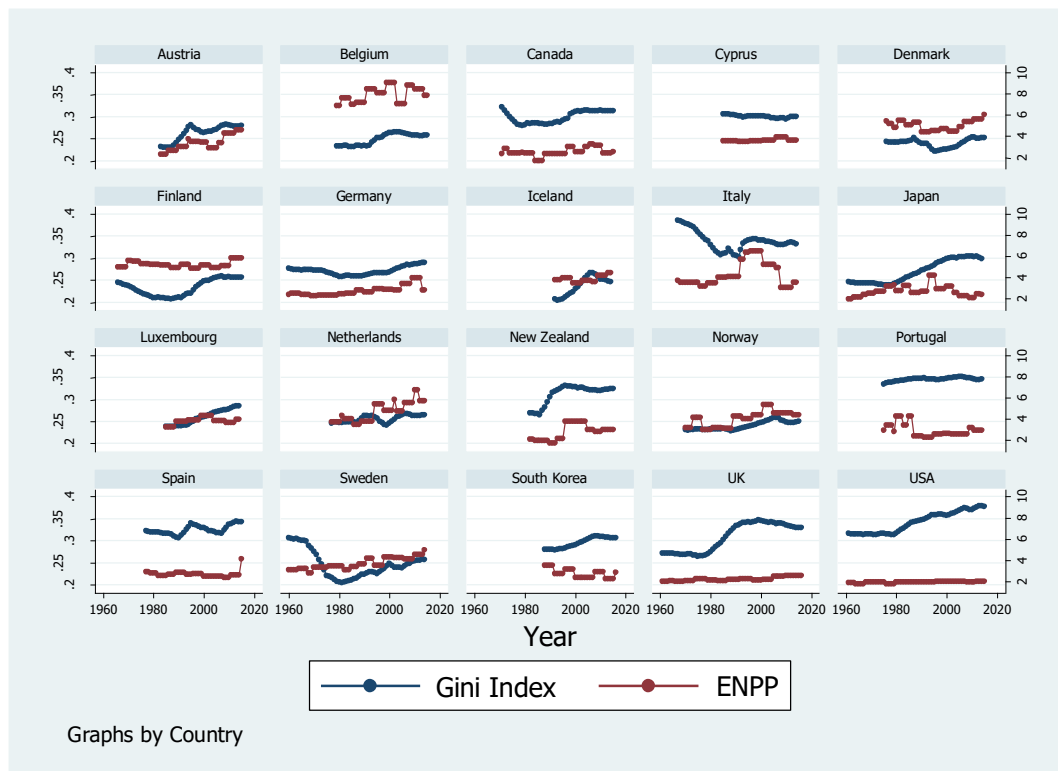
In the first place, these models generally reject the assumption of a sizable impact of party diversification on income inequality within countries and over time in the past 35 years. *ENPP* is only (weakly) significant in the 5th model. Lack of a statistically significant *ENPP* effect in models 3 and 4 is predictable because, unlike the HDI index that is used in model 5 which is normal by definition, GDP(PPP)pc and ECI are not range-bounded and are manually normalised by us for every year. Hence, every country's value on either indicator for every year is dependent on the maximum and minimum values of that year; i.e., is dependent on the economic performance of other countries. Models 3 and 5 suggest that there might be a weak interaction effect between the stage of development and the effect of *ENPP* on Gini. But regardless, the very low Average Adjusted R^2 figures remind that these models are essentially unfit and the within-country relations are simply too weak. This is also confirmed by the Hausman test result which yields a χ^2 values of -106.77 indicating that models fitted on this data fail to meet the asymptotic assumptions of the Hausman test.

Before ending this section, we make one last effort to investigate the impact of economic development on the effectiveness of political competitiveness for reduction of economic inequality. For this purpose, we review the trends of variation in *ENPP* and Gini in each individual country in our sample to check whether they show a positive or negative pattern of covariation over time or simply no relation between *ENPP* and Gini. Because there is a time aspect to the relationship of interest, fitting a correlation line is not the appropriate approach

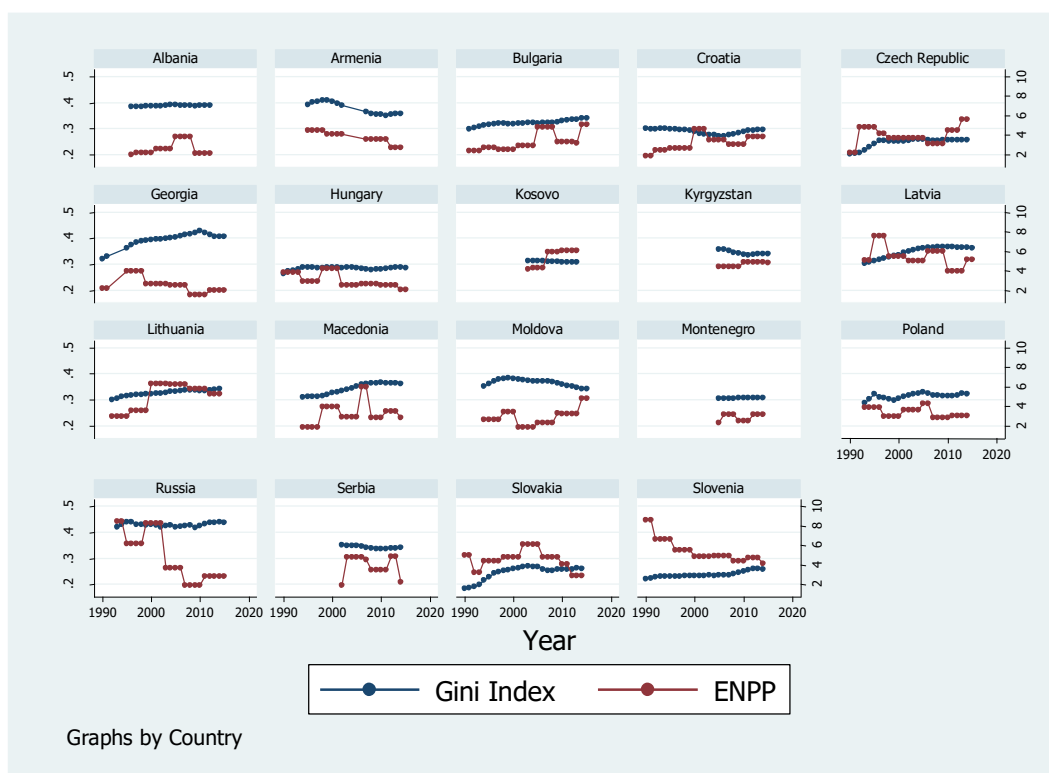
for judging the country-level effects. If there are time-lagged patterns of variation in the data, a useful paradigm for automatically detecting such patterns would be cross-correlation analysis. However, here we rely on manual coding of the observed patterns into the five categories below:

1. Strong movement in opposite direction (very negative)
2. Moderate movement in opposite direction (negative)
3. Moderate movement in similar direction (positive)
4. Strong movement in similar direction (very positive)
5. No observable pattern or mixed variation directions

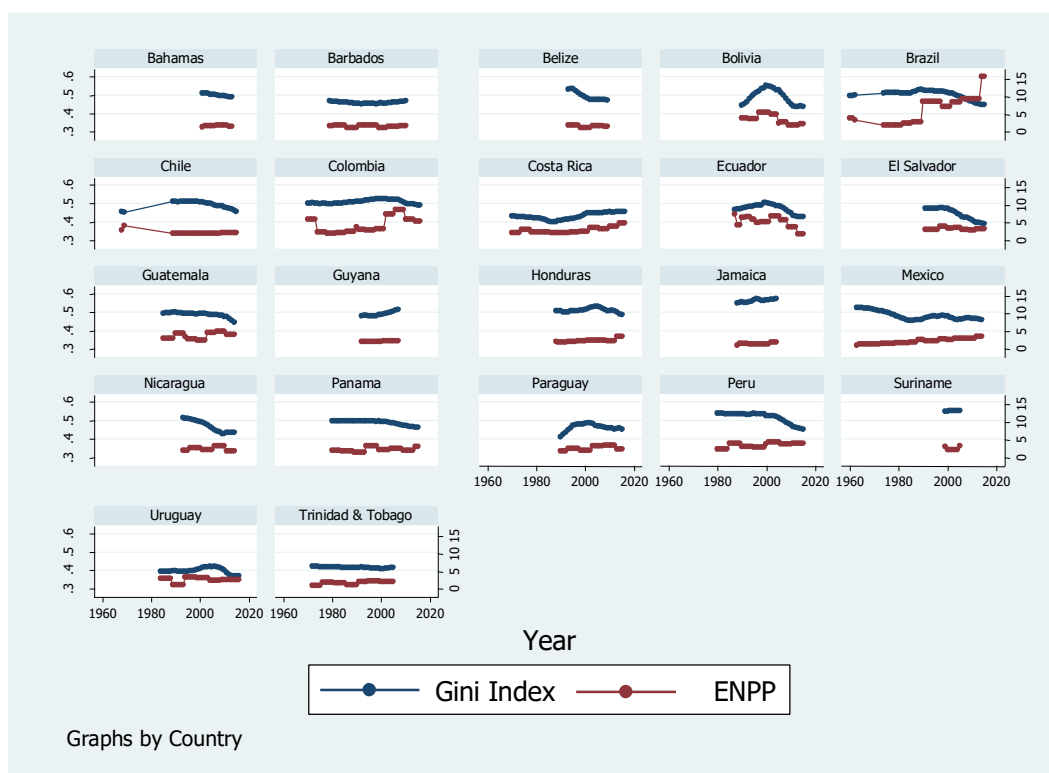
Appendix F lists countries classified in each category in various regions. Panels (a) to (e) in figure 6.8 illustrate patterns of variation in political competitiveness and income inequality in 89 countries located in six geographical regions for as many years as data is available since 1960.



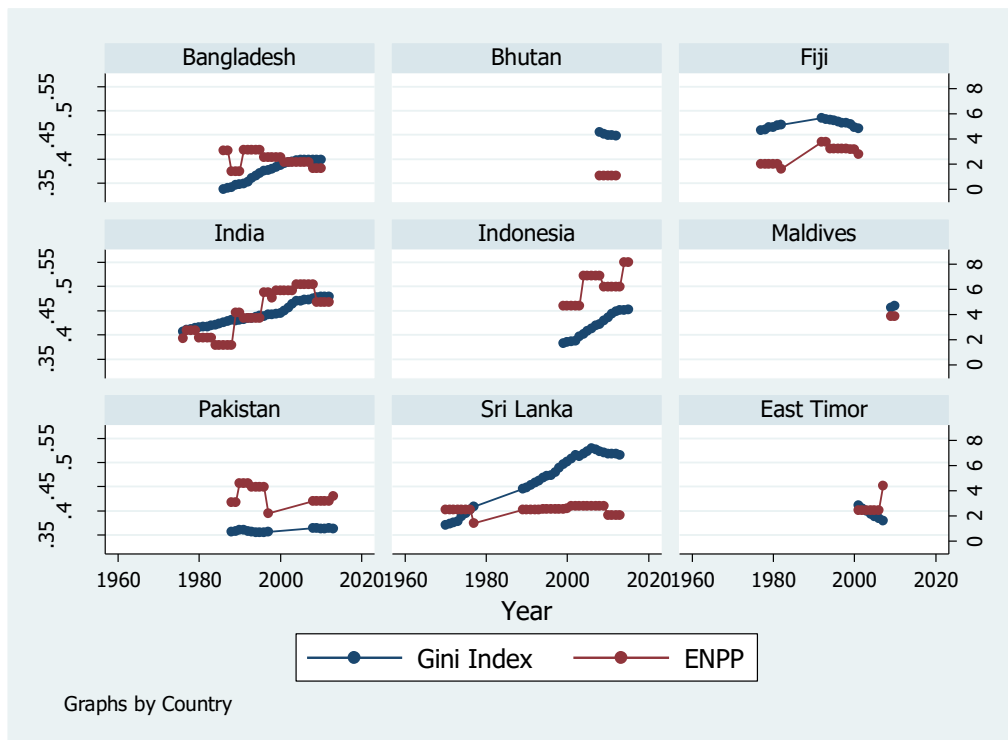
Panel (a): Western Europe, North America, Japan and South Korea



Panel (b): Eastern Europe including ex-USSR countries



Panel (c): Latin America



Panel (d): Asia excluding Japan and South Korea



Panel (e): Sub-Saharan Africa

Figure 6.8

Trends of variation in *ENPP* and disposable income inequality in 89 countries (1960-2016)

Suriname, Maldives, East Timor and Kenya are omitted due to the scant data available for the period. The left pane in figure 6.9 compares the share of each category of trends as per the classification explained above. When world regions are sorted by their level of economic

development (here using GDP(PPP) per capita as the criterion) a pattern emerges. The 'negative' and 'very negative' patterns which represent countries in which there has been an inverse relationship between *ENPP* and Gini are most frequently represented in the middle columns. This pattern suggests an increase in the likelihood that political competitiveness plays a role in decreasing economic inequality as countries reach the middle stages of development. But this potential decreases again as they transition to the higher stages of development.

The right-hand panel in figure 6.9 groups countries in five income categories with an equal number of countries in each category. This graph presents a slightly different picture in that, although the 'negative' and 'very negative' patterns become more frequent at the middle of the distribution and drop in numbers among high income economies, in the lower end the picture is slightly different and their number decreases between low income and lower middle income countries. The question of why stages of development might change the effectiveness of the political system in reducing economic inequality definitely needs further investigation but we will allude to some possible explanations in the conclusion to this chapter.

To conclude this section, it must be noted that the interaction between *party diversification* and *income inequality* depicted in figure 6.9 must be treated with caution because classifications in this analysis are based on average per capita GDP of countries between 2008-2015 and do not take into account the fact that some countries might have developed more rapidly than others and transcended from one income group to another, while others regressed, and others only grew at an average rate and maintained their rank in the sample.

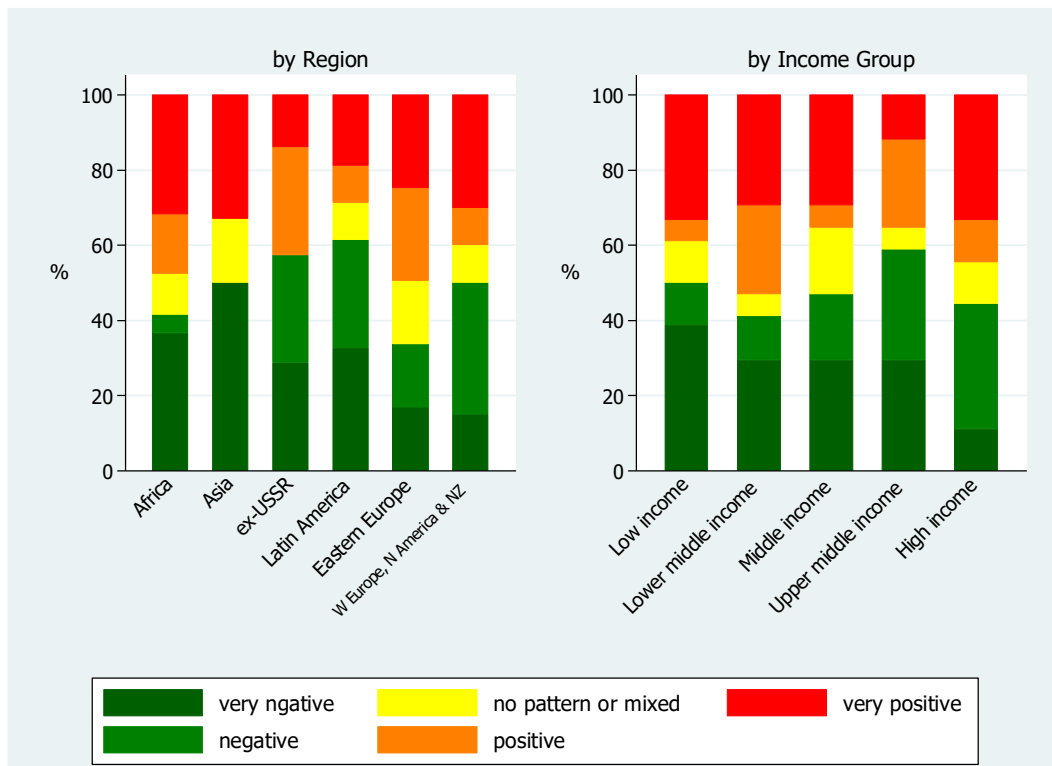


Figure 6.9

Strength of the ENPP-Gini correlation by region and income group for disposable income 1980-2014 (please refer to appendix F for classification details).

Note: Income groups of the right pane are based on average GDP(PPP) per capita over the period 2008-2015

Overall, results of the two above analyses provide modest support for the hypothesis that the stage of development matters for the effectiveness of the effect of political competitiveness on the reduction of income inequality (hypothesis 4).

6.7 Conclusion and discussion

In this chapter, we aimed to enhance the quality of previous empirical research on the fiscal outcomes of the electoral systems by answering three questions:

1. Is there a statistical relationship between the proportionality of electoral systems and the level of economic inequality between countries in a representative sample of all democracies worldwide?
2. Are there conditions that, if met, would allow us to hypothesise a causal path between electoral proportionality and the level of income equality in a world-wide cross-country comparison? and finally,
3. Is there a within-country relationship between party diversification and change in the level of income inequality? And, if so, is this relationship influenced by the country's stage of economic development?

Figure 6.10 shows the logical structure of the analysis carried out in this chapter along with the key outcomes of the investigation.

We used several between-effects and fixed-effects models on a panel of data for the period between 1980 and 2014 along with other methods and visualisations to test the five hypotheses derived from the above questions. Our investigation shows that proportionality *per se* does not play a role in explaining inequality observed between countries on a global scale. However, the effective number of parliamentary parties as a direct outcome empirically known to be related to the proportionality of electoral systems is inversely associated with the level of inequality of disposable income at the cross-country level. This conclusion is not supported at the intra-country level. Neither is it conclusively evidenced for the distribution of market income or the level of reduction in inequality as a result of government redistribution programs. This last conclusion of the study has to be used with caution because our data on the level of market inequality is considerably limited in terms of geographical coverage compared to the inequality of final distribution of income.

Our study suggests that the link between electoral disproportionality and the effective number of parliamentary parties is not automatic; rather, they are statistically more likely to align and fulfil theoretical expectation as a democracy grows older. Consequently, lower electoral disproportionality is effective in reducing income inequality only if it first can result in a diversification of the party system and electoral competitiveness manifested by a greater (effective) number of parties in parliament.

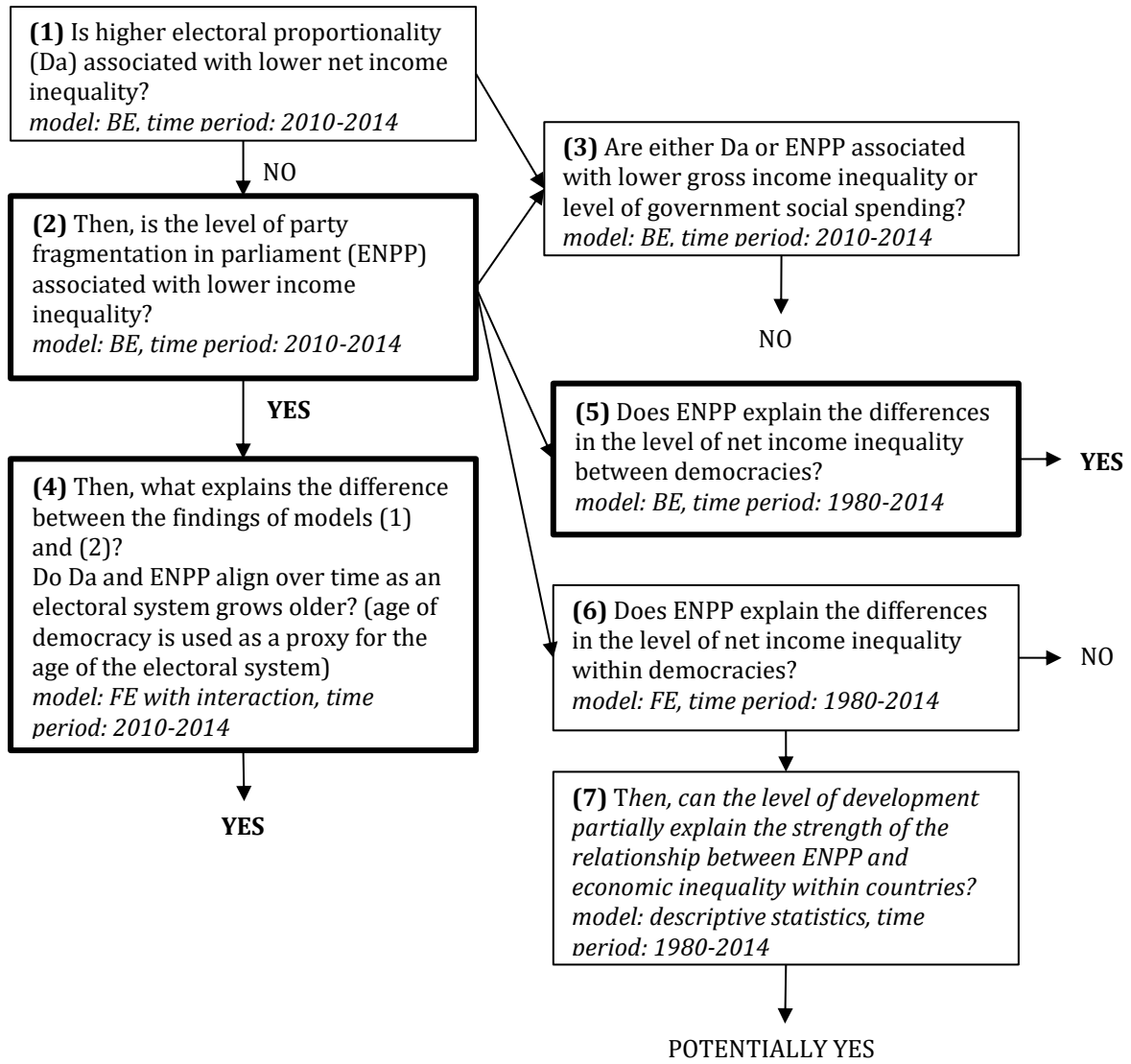


Figure 6.10

Logical structure of analysis and key findings of chapter 6

Note: Key findings are enclosed in thick black boxes

Our fifth analysis showed no relationship between party diversification and income inequality, thereby not confirming our theoretical prediction that higher parliamentary fragmentation should result in a reduction in the level of economic inequality. It must be acknowledged that, in order to supplement the findings of analyses 1 and 4, a more accurate design for the fifth analysis was needed, which would test the relationship between the level of party diversification after each election and the level of change in income inequality during the ensuing government ($\Delta Gini$) instead of the actual level of inequality ($Gini$):

$$ENPP_t \rightarrow Gini_{t+1} - Gini_t \quad (6.9)$$

or the average level of social spending during a government's period of office:

$$ENPP_t \rightarrow \overline{SOCX} \quad (6.10)$$

This design would be more advantageous because the level of inequality in a country varies over time due to factors that are not country-specific. But while data on the latter is not currently available outside the OECD, the former was not available to us either due to the structure of our multiply imputed disposable income *Gini* data.

Finally, again in relation to the third question asked in this chapter, our analyses showed an inconclusive relationship between the level of development and the degree of impact of party diversification on income inequality. The statistical model we developed to test this relation was neither fit nor robust. However, a second look at the data revealed that party diversification and the competition it can induce among vote-seeking politicians is most likely effective in reducing economic inequality in the middle stages of development. One (speculative) explanation for this observation could be that in the middle stages of development where the rate of economic growth is highest, economic expansion creates new sources of revenue allowing for more flexible social policy. At this stage, the economy is less prone to the limitations to growth faced in the later stages of capitalist production when, as the rate of growth drops, maintaining employment in part hinges upon creating more room for the operation of markets to offset the drop in the average rate of profit. The policy implication of this (regardless of how competitive the party system is) would be to curb or even reduce social spending by, for example, privatizing public assets and parts of the welfare system and making concessions for corporate and income taxation. When the choice between soaring unemployment and reducing the size of economic redistribution becomes a serious predicament for the parties and politicians, political competition cannot effectively deal with the material contradictions of the capitalist mode of production. In this situation, only unsustainable resort to populist policies such as deficit spending may temporarily curb the rise in equality. Eventually, though, such policy has to be counteracted in the face of solid material reality.

The concluding chapter will show how the findings in this chapter may be related to the theoretical framework laid in chapter 2.

Chapter 7

Conclusion

7.1 Introduction

Over the past three decades, in many democracies there has been a steady increase in economic inequality. The widening gap between social classes has raised concerns among policy-makers and has stimulated wide academic research on the topic. One area that has drawn the attention of political economists is the possible interaction between electoral institutions and the distribution of economic resources. There is a general consensus in the literature that there exists a positive relationship between the vote-seat proportionality of the electoral systems as the most fundamental principle of representative democracy and the level of social spending in the economically developed democracies. However, when it comes to the inequality of disposable income, conclusions are more tentative. Also, little has been done to expand the research scope to include less developed democracies. On the theoretical front, two rather conflicting positions have emerged to explain the micro causal relationships between electoral systems and economic outcomes. One line of argument focuses on the impact that electoral rules can have on the voting decisions of citizens belonging to different social classes. The other concentrates on how parties and politicians respond to the possibilities the electoral systems offer them to gain access to political power. Although some empirical efforts have been made to compare the explanatory capabilities of the two positions, important questions have yet to be addressed.

Building on the existing literature, we chose the vote-seat disproportionality as the key characteristic that distinguishes the various types of electoral systems. The goal of this dissertation was to shed light on some dynamics that are involved in translating the variation in electoral system types to economic distributional outcomes. Firstly, in order to achieve this aim, an appropriate metric had to be designed to measure electoral disproportionality on a continuum. Also, departing from the preliminary steps taken in previous studies, a methodology had to be developed to perform the intended measurement of what we call systemic electoral disproportionality. These steps enabled us to produce a dataset of systemic electoral disproportionality of the most contemporary electoral systems in 92 developing and developed democracies representing all geographic regions of the world.

This dataset, together with the 'Standardised World Income Inequality Database' (v 6.0 2017) of net income inequality worldwide, and the panel data produced on the level of party diversification of the countries in the sample, allowed us to build upon and extend the existing literature on the micro-causal mechanisms involved in linking electoral systems with economic

distributional outcomes. This was achieved by testing certain hypotheses empirically on a comprehensive set of old and new democracies. The panel character of the dataset enabled us to make use of different fixed-effects and between-effect dynamic models to correct for unobserved heterogeneities.

This final chapter highlights the central findings of each empirical chapter. The implications of this research are then discussed. The chapter concludes with suggestions for future research.

7.2 Key findings

Chapter 3 investigated the indices that have been designed so far to measure electoral disproportionality, identifying five types of general design defects. Three of these problems are exclusive to a subgroup of indices, whereas the other two are common to all.

First, is the problem of incomprehensiveness which arises when an underestimation or the total elimination of disproportionality of some parties is permitted and theoretically justified. Second, is the limited domain (when the index lacks value for certain seat allocations) or infinite range (when the index can approach infinity in its range). These two issues are listed under the same title because they are often the flip sides of the same coin. The third problem is unit insensitivity which occurs when an index ignores the relationship between the vote share and the seat share of individual parties in its construct and instead only uses their aggregate quantities in the measurement.

The fourth problem is the choice of an invalid reference point for proportionality. When can an index show absolute proportionality? Current indices hold that absolute proportionality is achieved when there is a parallel between the vote-share and the seat-share of all parties included in the measurement of the index. In reality, this is neither likely to be achieved mathematically nor is any electoral formula capable of realising this abstract definition.

Lastly, some of the electoral disproportionality is rooted in the size of the legislature being too small. More precisely, the likelihood of achieving maximum proportionality is in inverse relation to the size of the legislature. However, no index has considered this structural parameter in its construct.

In chapter 4, we looked at how electoral disproportionality is often measured and reported for countries or electoral systems. We showed that the common methodology for doing this involves calculating an index of disproportionality using the outcomes of real elections. Our study exposed two major weaknesses of this empirical approach.

The first problem is that real elections are very infrequent. Even a century of experience with democracy often generates no more than 25-30 data points for the empirical measurement of disproportionality. One measurement challenge is that every voting outcome is translated differently to a seat allocation by the same electoral system; hence, the same system yields different levels of disproportionality for different elections. To tackle this problem in the empirical tradition, the level of disproportionality of every country's electoral system is reported as a time-average over repeated measurements for different election years. When the sample of real election data is too small, the addition of every unit to the sample can cause a big shift in the average. Most democracies are just a few decades old and have held only a handful of

elections. Also, both young and old democracies undergo electoral reforms from time to time, further limiting the sample of usable empirical observations.

The second major issue concerns the behavioural adaptations of voters and parties to the limitations that an electoral system imposes on the principle of vote-seat proportionality. Disproportionality is a situation in which certain political preferences in society are not awarded parliamentary power proportionate to their size. In response to expectations about how the vote-seat translation is going to take place, voters and parties adjust their approaches to the elections. When votes in certain constituencies than in others are more valuable to the outcome, parties focus their campaigning investment on those particular areas. Simultaneously, when voters know, for example, that an electoral system is unfavourable for smaller parties, they choose not to vote for these parties because voters see no prospect of success for such small parties. This induces the voters to exercise strategic voting or to not vote at all. Both circumstances partially disguise the disproportionality of the electoral system because now only those votes that are likely to have an effect on the election outcome are cast.

In chapter 5, we produced systemic disproportionality data for 92 countries. Our simulation results allowed the comparison of the disproportionality of various electoral system types. Results of these comparisons that were displayed in figure 5.14 are summarised as follows:

There is a considerable variation in the systemic disproportionality within each class of the electoral systems. This is especially true with classes that show lower average disproportionality and can be up to 30% of the observed range of variation of the systemic disproportionality (0-33).

Our decomposition of electoral disproportionality for various systems shows that the structure of the districting is the single most influential design component of the electoral systems affecting their level of disproportionality, followed by the electoral formula and the electoral threshold.

Two systems with very large electoral districts occupy exceptional positions in the ranking of the electoral system classes:

- The mixed-member proportional system has the potential to rank among the most proportional classes of electoral systems. However, due to defective compensatory mechanisms or a high electoral threshold, MMP systems currently used for national elections rank among the semi-proportional electoral systems.
- The majority bonus systems in use show a wide variation in disproportionality depending on the design and eligibility criteria for the award of the majority bonus. This makes it difficult to categorise MBS systems as proportional or majoritarian.

Among majoritarian systems, a low-variance growth in average district magnitude considerably decreases the systemic disproportionality of the electoral system, whereas a high-variance departure of the average district magnitude from unity does not significantly improve the proportionality of the system. Even when the average district magnitude increases above the unity, if there are many single-member districts in the system, proportionality does not improve much from a pure FPTP system; whereas,

when almost all electoral districts grow in size to two, improvement in proportionality is remarkable. This explains why the binomial class stands below the mixed-majoritarian systems in terms of systemic disproportionality.

Simulation results were also used to assess the ability of the empirical method to correctly measure systemic electoral disproportionality. This was done by comparing our results with those reported in two empirical studies by Gallagher (2005) and Iversen and Soskice (2006) (see table 5.15). The correlation coefficients between our produced data points and those reported in the above studies (17 and 13 data points) were 0.71 and 0.86 respectively. These results are statistically strong but clearly show a remarkable difference. Further, while in the former, error is concentrated in the least proportional part of the spectrum, in the latter it is scattered all along. This is another indication of the internal inconsistency of the empirical method when used to study systemic electoral disproportionality.

Chapter 6 investigated the relationship between systemic electoral disproportionality and economic inequality in a sample of world democracies, using statistical modelling.

To what extent can electoral proportionality play a role in controlling the level of income inequality within countries? Income inequality may be studied at three levels: (1) inequality of gross (pre-tax) income, (2) the level of reduction in income inequality as a result of government social spending, and (3) inequality of disposable income. Findings in chapter 6 indicated that proportionality *per se* does not play a role in explaining the difference in inequality observed between countries on a global scale. However, the effective number of parliamentary parties as a manifest effect that is empirically known to be related to the systemic proportionality of electoral systems is inversely associated with the level of inequality of disposable income at the cross-country level comparison. In other words, countries with higher levels of party diversification experience lower income inequality.

However, a similar inference cannot be conclusively drawn for the distribution of market income or the level of reduction in inequality as a result of government redistribution programs. On the one hand, this conclusion of the study has to be considered with caution because our data on the level of market inequality is considerably limited in terms of geographical coverage compared to the inequality of final distribution of income. On the other, it must be noted that government involvement in economic distribution takes various forms and shapes and is not solely reflected in the level of social spending. The development policy, employment and labour market policy, and other policy tools are utilised by the governments to various extents to regulate economic life of the society. As a result, governments cannot be compared in their administration of individual policy areas. Instead what is comparable is the aggregate impact of these involvements in the final distribution of economic resources.

But how does systemic disproportionality translate into the diversification of the party system? Based on our findings, the link between electoral disproportionality and the effective number of parliamentary parties is not automatic; rather, the two variables are statistically more likely to align, as predicted by theory, as a democracy grows older.

Finally, does the diversification of the party system affect the within-country level of income inequality? And if so, is this relationship influenced by the country's stage of economic development? Our analyses showed an inconclusive relationship between the level of development and the degree of impact of party diversification on income inequality within

countries. The statistical model we developed to test this relationship was not a good fit; nor was it robust. However, a second look at the data revealed that party diversification and the competition it can induce among vote-seeking politicians is most likely to be effective in reducing economic inequality in the middle stages of economic development.

The distinction this research made between the systemic character of the electoral system's disproportionality and empirical outcomes associated with it, and the use of both simultaneously in the same empirical models is a novel undertaking. Furthermore, it has important implications for understanding the dynamics of the causal effects between an increase in political competitiveness and a decrease in economic inequality. In chapter 2, we introduced two streams of theories in the literature dealing with this question. One stream consists of the theories regarding the behaviour of the voters and the way they respond to the possibilities offered by the electoral system. The second stream comprises the theories that consider how parties frame their strategies and set their agendas either in opposition or when in office to maintain and possibly expand their popular mandate and their access to the seats of political power.

This study revealed the significance of party diversification as a means of controlling the level of net income inequality; hence, there is reason to doubt the credibility of the voter-centred theories such as those that analyse the level and composition of voter turnout or those that seek to model the party choices of the voters and their calculations based on their socio-economic attributes such as socio-economic class. Neither of these lines of argument is specifically sensitive to the level of competitiveness of the party system as they both take the structure of the party system as exogenous. In other words, it does not matter in this approach whether the proportionality condition leads to a three-party legislature or a ten-party one, whereas our research reveals sensitivity to this variation. By the same token, of the four intermediary mechanisms enumerated at the end of section 2.4.2, the first three, which belong to the voter-centred family of theories, find little empirical support.

Yet, our findings in sections 6.6.1, 6.6.3, and 6.6.4 concerning the significance of party diversification for the relation between electoral systems and economic inequality, empirically confirm the macro-level validity of the fourth group of intermediary mechanisms listed in section 2.4.2. Although a conclusive rejection of former three mechanisms warrants more thorough examination, our empirical investigation provides support for Persson, Roland and Tabellini's assertion in the context of the study of the level of social spending (quoting from Riker 1982) that "what matters for the study of the economic effects of the electoral systems is not the expected utility calculus of the voters but rather that of politicians and parties" (Persson, Roland and Tabellini 2007, 3). In other words, they argued that proportional systems induce higher social spending than the majoritarian systems, but only through greater party fragmentation and a higher incidence of coalition government. When the level of party diversification and the resulting type of government is held constant, the electoral rules have no direct effect on public spending.

Previously, this outcome was empirically investigated and confirmed using basic and inexact measures of electoral disproportionality, but only for social spending. When it came to the level of net income inequality, studies were more sceptical (e.g., Verardi 2005; Feld & Schnellenbach 2014; Murawski 2015). By developing and measuring an accurate index of systemic electoral

disproportionality, we empirically showed that the same claim is valid also for net income inequality when comparing democracies on a global scale.

7.3 Policy implications

The methodology developed in this study allows the total systemic disproportionality of an electoral system to be decomposed into the contributions made by its constituent components and their various combinations. This is a very important functionality because it enables a close investigation of the distortions introduced to the principle of democratic representation upon the design of a system. As mentioned in the previous chapters, the vote-seat proportionality is not the only maxim an electoral system is expected to achieve. However, it is the supreme one whose violation needs to be accompanied by clear justifications.

The simulation methodology produced a highly precise metric for quantifying the extent of compromises to the principle of vote-seat proportionality caused by design elements such as minority quotas, electoral thresholds, electoral formula, the size of the electoral districts, and the size of the legislature. This possibility would raise sensitivity to the implications of such arrangements and enrich the public debate concerning plausible electoral reform scenarios and would allow for a more informed negotiation and bargaining process among the stakeholders. Moreover, it would encourage regular monitoring and occasional revision of certain aspects of the electoral system, such as the structure of the districting and the size of the legislature as a result of changes in electoral demographics.

The second implication of this study for policy making derives from the significant role that party diversification can play in containing economic inequality. As elaborated above, a fragmentation of the political decision-making power among more parties means less certainty for each party in terms of their ability to sustain an absolute majority and to rule unilaterally. This can intensify competition for parliamentary survival among the parties which, through various mechanisms, translates into a more inclusive representation of the interests of all social groups and eventually a fairer compromise between the interests of the labour and capital.

This study showed that in democracies, proportional electoral systems will in most cases eventually usher in the diversification of the party system over time. However, this is one area where policy interference can promise acceleration in the adaptation process. Many democracies have so far developed initiatives and mechanisms to curb the excessive fragmentation of the party system. Binomial and majority bonus systems are two examples of electoral designs intended for this purpose. Similarly, electoral measures may be developed to facilitate competition in the parliament and to prevent monolithic parties or duopolies from presiding over the party system and the decision-making apparatus for extended periods.

7.4 Potential avenues for further research

This research indicates that diversification in the party system is a determinant of economic inequality. Diversification in the party system may represent, among other things, either intensified political competitiveness or more distributed executive power (i.e. higher cabinet fragmentation and more likelihood of coalition government). Due to the lack of good quality data and consideration of space, our research did not step further into investigating the micro-causal relations involved in relating party competition to economic distribution. Further

research needs to be conducted to clarify the micro-causal mechanisms involved in the observed empirical relationship between the two variables. In particular, we need to know how and under what conditions either of the two likely channels (or perhaps other ones) links party diversification with change in the level of net income inequality. The literature points to two theoretically possible consequences of increased electoral competition, namely: (1) change in the government left-right partisanship; and (2) change in the income bias of the turnout due to increased incentives for the pro-redistribution citizens to vote in the elections.

A third possibility, that needs to be examined, would be a general left shift to the centre of gravity of the politics through change in the electoral discourse of most parties and concomitant increase in the electoral welfare commitments by the parties. Few theoretical studies have tried to model electoral uncertainty and the way parties respond to it (e.g., Persson and Tabellini 1997, 99 & 2000; Debowicz et al. 2016 & 2018; and Lizzeri and Persico 2001). Better models need to be developed and empirically tested in this regard. As a corollary to the conduct of this research, this issue was explored in the case of New Zealand, with interesting revelations (see Aminnaseri and Mooi-Reci 2014).

The best way to empirically probe into the micro-causalities of the kind enumerated above as well as those hypothesised in the literature (see chapter 2), is to use direct data indicating motives and incentives of the voters and politicians. A majority of studies so far (ours included) have concentrated on the interactions between the country level factors that are hypothesised as being symptomatic of micro-level causalities (Gagliarducci et al. 2011). This gap, which is mainly caused by the lack of standardised cross-nation panel data, needs to be addressed by future studies.

Further, and closely related to the literature on power resource theory (e.g. Stephens 1979; Korpi 1983 & 1998; Huber and Stephens 1993 & 2001), the impact of diversification in the party system on the gross distribution of income, i.e., the struggle between labour and capital in the production sphere, needs to be investigated more thoroughly and with better quality data.

In the literature surveyed in this study, Persson et al.'s (2003, 2007) coalition effect theory is one of the most articulated theoretical models developed to date to explain the dynamics of party competition in multi-party systems. The addition of the effective number of coalition partners in future statistical modellings at the macro level, will allow the empirical validity of this hypothesis to be tested, and will take our understanding one step further.

With regards to the within-country relation between party competition and inequality, investigated in section 6.6.5, the impact of the stage of development on this relation needs further scrutiny. At the same time, other explanations for why a statistically significant relation is not observable in a global sample need to be hypothesized and tested with empirical data.

Another avenue of research that extends this study is to produce systemic disproportionality data for the electoral systems that have been used in the past in democracies. Temporal enhancement of data on systemic disproportionality enables future research to develop better models and test more complicated hypotheses. However, such endeavour could be hampered by the inaccessibility of legal archives and demographic data of the past which is a limitation faced by the current study as well.

From a methodological perspective, better simulation algorithms could be developed to incorporate more design components in electoral systems. These components could include ballot access restrictions for the voting age population, party nomination rules and joint electoral lists. Also, theoretical approaches could be extended to interpret and simulate systemic disproportionality for more electoral system types such as bicameral systems, two-round voting systems, single transferable vote systems and alternative vote systems. This will expand the sample size and coverage to include more democracies and more time periods allowing for more precise conclusions.

Finally, as noted in chapter 5, the pragmatic approach taken in this research to the decomposition of systemic disproportionality for a selected number of cases can evolve to a systemic endeavour to produce a wealth of data on the disproportionality induced by interactions between various elements of the electoral systems in different system classes. The methodological framework for such research has already been laid down in this study. The produced data allows the fitting of statistical models using equation 5.2 to estimate the contribution of each design component to the overall systemic disproportionality of an electoral system in each system class. This quantitative data enables researchers to assess the qualitative arguments put forward in the literature regarding the magnitude of impact of different electoral design components on the overall disproportionality of the electoral systems.

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Appendices

Appendix A

Number of parties above different electoral thresholds in 17 countries with proportional electoral systems and their share of the total vote in the most recent general election

Table A.1

Empirical data used to control for some behaviour effects in the simulation model

Country	Election Year	1% Threshold		3% Threshold		5% Threshold	
		# of parties	Share of vote	# of parties	Share of vote	# of parties	Share of vote
Slovenia	2014	11	97.76	8	91.25	6	82.92
Bulgaria	2017	11	98.56	6	87.42	4	80.02
Austria	2013	8	98.99	7	97.96	5	89.47
Netherlands	2017	13	98.60	10	92.60	7	82.90
Denmark	2015	9	99.20	9	99.20	5	88.20
Norway	2013	9	98.20	7	94.30	6	90.20
Sweden	2014	9	99.03	9	99.03	7	91.34
East Timor	2012	11	93.89	4	79.95	3	76.84
Indonesia	2014	11	99.09	10	97.63	10	97.63
Sri Lanka	2015	4	97.53	4	97.53	2	88.04
South Africa	2014	6	95.50	3	90.73	3	90.73
Namibia	2014	6	98.78	4	95.63	4	95.63
Honduras	2013	7	98.41	4	93.27	4	93.27
El Salvador	2015	7	97.83	4	92.08	4	92.08
Guyana	2015	2	99.49	2	99.49	2	99.49
Colombia	2014	10	97.32	9	95.87	5	79.60
Brazil	2014	18	92.92	11	91.37	7	77.71
Mean		8.94	97.71	6.53	93.84	4.94	88.00

Appendix B

Optimum size of the legislature

Table B.1 lists actual and optimum sizes of the legislatures for 179 countries using various formulas for the calculation of optimum size.

Sources of data for population and population median age is *The World Factbook* 2014-15. Washington, DC: Central Intelligence Agency, 2014. Source of data on legislature type and size is: *Parliaments at a Glance*, Inter-Parliamentary Union accessed:22/04/2016 (<http://www.ipu.org/parline-e/NumberofSeats.asp?REGION=All&LANG=ENG&typesearch=1>)

Voting age population is reported in other sources more directly. For example Institute for Democracy and Electoral Assistance provides VAP in its voter turnout database (<http://www.idea.int/data-tools/data/voter-turnout>). This source reports population size and VAP figures per every election year per country. In this research we chose to calculate the VAP based on the CIA demographic data because CIA Factbooks provide annually updated data for all countries which allows for better comparability.

Our method for the calculation of VAP is as follows:

We assume a linear relation between population (P) and the VAP. This may be presented as:

$$\frac{VAP}{P} = a \text{ Median Age} + b$$

To calculate the slope (a) and intercept (b) of this line, we need to have at least two pairs of VAP and P coordinates.

Given that setting the voting age at 18 has now become a universal trend with only a few exceptions, first we make the same assumption for all countries.⁹⁹ Subsequently, if the median age of the population is 18 in a hypothetical country, 50% of the population would be eligible to vote. This would be our first pair.

For the second pair we use empirical data for Japan as the country with the highest median age (46.1 years). Based on the data from Japan Statistical Yearbook (2016, 51)¹⁰⁰, in 2014, 84.4% of the Japanese population were 18 years old or older.

Having these two pairs of coordinates in hand, we arrive at:

$$a = 0.01224 \text{ and } b = .2796$$

Having P and the $\frac{VAP}{P}$ ratio we can calculate VAP for all countries.

VAP calculated by this method is in perfect correlation with the VAP figures reported by the Institute for Democracy and Electoral Assistance (correlation coefficient = 0.999604)

⁹⁹ Voting age data for all countries may be found from the CIA factbook at this address: <https://www.cia.gov/library/publications/the-world-factbook/fields/2123.html>

¹⁰⁰ Available at: <http://www.stat.go.jp/english/data/nenkan/1431-02.htm>

Table B.1

Actual and optimum size of the legislatures for 179 countries when using different formulas

Country	Type of Legislature	Population	Median age	% eligible pop	Eligible Population	Lower House (existing)	OSL_p	$\sqrt[3]{VAP}$	OSL_a	Population/Seats	% Population /Seat	Electorate / Seat
Afghanistan	bicameral	31,822,848	18.1	0.50	15,950,381	250	317	252	299	—	0.40	63,802
Albania	unicameral	3,020,209	31.6	0.67	2,012,942	140	145	126	147	21,573	0.71	14,378
Algeria	bicameral	38,813,722	27.3	0.61	23,825,823	462	339	288	343	64,049	0.22	51,571
Angola	unicameral	19,088,106	17.9	0.50	9,520,685	220	267	212	250	86,764	0.45	43,276
Argentina	bicameral	43,024,374	31.2	0.66	28,464,680	257	350	305	364	130,773	0.39	110,758
Armenia	unicameral	3,060,631	33.7	0.69	2,118,566	131	145	128	149	23,364	0.76	16,172
Australia	bicameral	22,507,617	38.3	0.75	16,847,231	150	282	256	304	99,591	0.67	112,315
Austria	bicameral	8,223,062	44.3	0.82	6,759,064	183	202	189	222	33,564	0.55	36,935
Azerbaijan	unicameral	9,686,210	30.1	0.65	6,277,905	125	213	184	217	77,490	0.80	50,223
Bahamas, The	bicameral	321,834	31.2	0.66	212,923	38	69	60	68	5,960	2.63	5,603
Bahrain	bicameral	1,314,089	31.6	0.67	875,828	40	110	96	110	16,426	2.50	21,896
Bangladesh	unicameral	166,280,712	24.3	0.58	95,964,681	300	550	458	553	554,269	0.33	319,882
Barbados	bicameral	289,680	37.6	0.74	214,346	30	66	60	68	5,680	3.33	7,145
Belarus	bicameral	9,608,058	39.4	0.76	7,321,135	110	213	194	229	55,219	0.91	66,556
Belgium	bicameral	10,449,361	43.1	0.81	8,435,497	150	219	204	240	47,282	0.67	56,237
Belize	bicameral	340,844	21.8	0.55	186,277	31	70	57	65	7,927	3.23	6,009
Benin	unicameral	10,160,556	17.7	0.50	5,042,962	83	217	171	201	122,416	1.20	60,759
Bhutan	bicameral	733,643	26.2	0.60	440,467	47	90	76	87	10,189	2.13	9,372
Bolivia	bicameral	10,631,486	23.4	0.57	6,018,556	130	220	182	214	64,045	0.77	46,297
Bosnia & Herzegovina	bicameral	3,871,643	40.8	0.78	3,016,464	42	157	144	169	67,924	2.38	71,821
Botswana	bicameral	2,155,784	22.9	0.56	1,207,208	63	129	106	123	21,998	1.59	19,162
Brazil	bicameral	202,656,788	30.7	0.66	132,836,115	513	587	510	619	341,173	0.19	258,940
Brunei	unicameral	422,675	29.3	0.64	269,808	33	75	65	74	12,808	3.03	8,176
Bulgaria	unicameral	6,924,716	42.6	0.80	5,547,757	240	191	177	208	28,853	0.42	23,116
Burkina Faso	unicameral	18,365,123	17	0.49	8,957,735	127	264	208	245	144,607	0.79	70,533
Burundi	bicameral	10,395,931	17	0.49	5,070,698	100	218	172	201	—	1.00	50,707
Cabo Verde	unicameral	538,535	24	0.57	308,823	72	81	68	77	7,480	1.39	4,289
Cambodia	bicameral	15,458,332	24.1	0.57	8,883,534	123	249	207	244	84,013	0.81	72,224
Cameroon	bicameral	23,130,708	18.3	0.50	11,650,303	180	285	227	268	82,610	0.56	64,724

Table B.1 (Continued)

Country	Type of Legislature	Population	Median age	% eligible pop	Eligible Population	Lower House (existing)	OSL_p	$\sqrt[3]{VAP}$	OSL_a	Population/Seats	% Population/Seat	Electorate / Seat
Canada	bicameral	34,834,841	41.7	0.79	27,524,235	338	327	302	360	78,634	0.30	81,432.65
Central African Rep.	unicameral	5,277,959	19.4	0.52	2,729,437	105	174	140	163	50,266	0.95	25,995
Chad	unicameral	11,412,107	17.2	0.49	5,594,287	188	225	178	208	60,703	0.53	29,757
Chile	bicameral	17,363,894	33.3	0.69	11,934,247	120	259	229	270	109,898	0.83	99,452
China	unicameral	1,355,692,576	36.7	0.73	988,198,572	2,987	1107	996	1233	453,864	0.03	330,833
Colombia	bicameral	46,245,297	28.9	0.63	29,293,515	166	359	308	368	172,557	0.60	176,467
Comoros	unicameral	766,865	19.2	0.51	394,698	33	92	73	84	23,238	3.03	11,961
Congo, DR	bicameral	77,433,744	17.9	0.50	38,622,077	500	426	338	405	127,358	0.20	77,244
Congo, Rep.	bicameral	4,662,446	19.8	0.52	2,433,962	139	167	135	157	22,097	0.72	17,511
Costa Rica	unicameral	4,755,234	30	0.65	3,076,179	57	168	145	170	83,425	1.75	53,968
Côte d'Ivoire	unicameral	22,848,945	20.3	0.53	12,067,820	255	284	229	271	89,604	0.39	47,325
Croatia	unicameral	4,470,534	42.1	0.80	3,554,217	151	165	153	178	29,606	0.66	23,538
Cuba	unicameral	11,047,251	39.9	0.77	8,485,389	612	223	204	240	18,051	0.16	13,865
Cyprus	unicameral	1,172,458	35.7	0.72	840,281	80	105	94	109	14,656	1.25	10,504
Czech Republic	bicameral	10,627,448	40.9	0.78	8,293,040	200	220	202	239	37,820	0.50	41,465
Denmark	unicameral	5,569,077	41.6	0.79	4,393,506	179	177	164	192	31,112	0.56	24,545
Djibouti	unicameral	810,179	22.8	0.56	452,696	65	93	77	88	12,464	1.54	6,965
Dominican Republic	bicameral	10,349,741	27.1	0.61	6,327,853	183	218	185	217	48,138	0.55	34,578
Ecuador	unicameral	15,654,411	26.7	0.61	9,494,483	137	250	212	250	114,266	0.73	69,303
Egypt	unicameral	86,895,099	25.1	0.59	51,000,310	596	443	371	445	145,797	0.17	85,571
El Salvador	unicameral	6,125,512	25.6	0.59	3,632,668	84	183	154	180	72,923	1.19	43,246
Equatorial Guinea	bicameral	722,254	19.4	0.52	373,505	100	90	72	82	4,249	1.00	3,735
Eritrea	unicameral	6,380,803	19.1	0.51	3,276,326	150	185	149	173	42,539	0.67	21,842
Estonia	unicameral	1,257,921	41.2	0.78	986,227	101	108	100	115	12,455	0.99	9,765
Ethiopia	bicameral	96,633,458	17.6	0.50	47,843,534	547	459	363	436	147,532	0.18	87,465
Fiji	unicameral	903,207	27.9	0.62	561,068	50	97	82	95	8,769	2.00	11,221
Finland	unicameral	5,268,799	43.2	0.81	4,259,814	200	174	162	190	26,344	0.50	21,299
France	bicameral	66,259,012	40.9	0.78	51,704,665	577	405	373	447	71,631	0.17	89,609
French Polynesia	unicameral	280,026	30.6	0.65	183,206	57	65	57	64	4,913	1.75	3,214
Gabon	bicameral	1,672,597	18.6	0.51	848,584	120	119	95	109	7,534	0.83	7,072

Table B.1 (Continued)

Country	Type of Legislature	Population	Median age	% eligible pop	Eligible Population	Lower House (existing)	OSL_p	$\sqrt[3]{VAP}$	OSL_a	Population/Seats	% Population /Seat	Electorate / Seat
Gambia, The	unicameral	1,925,527	20.2	0.53	1,014,622	53	124	100	116	36,331	1.89	19,144
Georgia	unicameral	4,935,880	37.7	0.74	3,658,312	150	170	154	180	32,906	0.67	24,389
Germany	bicameral	80,996,685	46.1	0.84	68,361,202	630	433	409	492	115,875	0.16	108,510
Ghana	unicameral	25,758,108	20.8	0.53	13,761,979	275	295	240	284	93,666	0.36	50,044
Greece	unicameral	10,775,557	43.5	0.81	8,751,592	300	221	206	243	35,919	0.33	29,172
Guatemala	unicameral	14,647,083	21	0.54	7,861,469	158	245	199	234	92,703	0.63	49,756
Guinea	unicameral	11,474,383	18.7	0.51	5,835,520	114	226	180	211	100,652	0.88	51,189
Guinea-Bissau	unicameral	1,693,398	19.8	0.52	884,014	102	119	96	111	16,602	0.98	8,667
Guyana	unicameral	735,554	25	0.59	430,809	65	90	76	86	11,316	1.54	6,628
Haiti	bicameral	9,996,731	22.2	0.55	5,512,361	99	215	177	207	77,494	1.01	55,680
Honduras	unicameral	8,598,561	21.9	0.55	4,709,808	128	205	168	196	67,176	0.78	36,795
Hong Kong	unicameral	7,112,688	43.2	0.81	5,750,595	70	192	179	210	101,610	1.43	82,151
Hungary	unicameral	9,919,128	41.1	0.78	7,764,594	199	215	198	233	49,845	0.50	39,018
Iceland	unicameral	317,351	36.4	0.73	230,159	63	68	61	70	5,037	1.59	3,653
India	bicameral	1,236,344,631	27	0.61	754,390,215	545	1073	910	1124	1,564,993	0.18	1,384,202
Indonesia	bicameral	253,609,643	29.2	0.64	161,577,320	560	633	545	662	366,488	0.18	288,531
Iran	unicameral	80,840,713	28.3	0.63	50,613,766	290	432	370	444	278,761	0.34	174,530
Iraq	unicameral	32,585,692	21.5	0.54	17,689,044	325	319	261	309	100,264	0.31	54,428
Ireland	bicameral	4,832,765	35.7	0.72	3,463,561	166	169	151	177	21,384	0.60	20,865
Israel	unicameral	7,821,850	29.9	0.65	5,050,409	120	199	172	201	65,182	0.83	42,087
Italy	bicameral	61,680,122	44.5	0.82	50,849,882	630	395	370	445	64,858	0.16	80,714
Jamaica	bicameral	2,930,050	24.9	0.58	1,712,525	63	143	120	139	34,882	1.59	27,183
Japan	bicameral	127,103,388	46.1	0.84	107,275,259	480	503	475	575	176,043	0.21	223,490
Jordan	bicameral	7,930,491	21.8	0.55	4,334,168	150	199	163	191	37,764	0.67	28,894
Kazakhstan	bicameral	17,948,816	29.7	0.64	11,545,240	107	262	226	267	116,551	0.93	107,899
Kenya	bicameral	45,010,056	19.1	0.51	23,111,142	349	356	285	339	108,197	0.29	66,221
Korea, North	unicameral	24,851,627	33.4	0.69	17,111,008	687	292	258	306	36,174	0.15	24,907
Korea, South	unicameral	49,039,986	40.2	0.77	37,847,699	300	366	336	402	163,467	0.33	126,159
Kosovo	unicameral	1,859,203	27.8	0.62	1,152,652	120	123	105	121	15,493	0.83	9,605
Kuwait	unicameral	2,742,711	28.9	0.63	1,737,336	65	140	120	139	42,196	1.54	26,728

Table B.1 (Continued)

Country	Type of Legislature	Population	Median age	% eligible pop	Eligible Population	Lower House (existing)	OSL_p	$\sqrt[3]{VAP}$	OSL_a	Population/Seats	% Population /Seat	Electorate / Seat
Kyrgyzstan	unicameral	5,604,212	25.7	0.59	3,330,377	120	178	149	174	46,702	0.83	27,753
Laos	unicameral	6,803,699	22	0.55	3,735,012	132	189	155	181	51,543	0.76	28,296
Latvia	unicameral	2,165,165	41.4	0.79	1,702,821	100	129	119	138	21,652	1.00	17,028
Lebanon	unicameral	5,882,562	29.3	0.64	3,755,042	128	181	155	182	45,958	0.78	29,336
Lesotho	bicameral	1,942,008	23.6	0.57	1,104,138	120	125	103	119	12,693	0.83	9,201
Liberia	bicameral	4,092,310	17.9	0.50	2,041,145	73	160	127	147	39,731	1.37	27,961
Libya	unicameral	6,244,174	27.5	0.62	3,848,277	200	184	157	183	31,221	0.50	19,241
Lithuania	unicameral	3,505,738	41.2	0.78	2,748,548	141	152	140	163	24,863	0.71	19,493
Luxembourg	unicameral	520,672	39.6	0.76	398,015	60	80	74	84	8,678	1.67	6,634
Macau	unicameral	587,914	37.7	0.74	435,742	33	84	76	87	17,816	3.03	13,204
Macedonia	unicameral	2,091,719	36.8	0.73	1,527,267	123	128	115	133	17,006	0.81	12,417
Madagascar	bicameral	23,201,926	19.2	0.51	11,941,808	151	285	229	270	126,097	0.66	79,085
Malawi	unicameral	17,377,468	16.3	0.48	8,327,084	193	259	203	239	90,039	0.52	43,146
Malaysia	bicameral	30,073,353	27.7	0.62	18,607,806	222	311	265	315	102,991	0.45	83,819
Maldives	unicameral	393,595	27.1	0.61	240,644	85	73	62	71	4,631	1.18	2,831
Mali	unicameral	16,455,903	16	0.48	7,825,045	160	254	199	234	102,849	0.63	48,907
Malta	unicameral	412,655	40.9	0.78	322,011	65	74	69	78	—	1.54	4,954
Mauritania	bicameral	3,516,806	19.9	0.52	1,840,203	146	152	123	142	17,410	0.68	12,604
Mauritius	unicameral	1,331,155	33.9	0.69	924,683	70	110	97	112	19,017	1.43	13,210
Mexico	bicameral	120,286,655	27.3	0.61	73,838,027	500	494	420	506	191,539	0.20	147,676
Moldova	unicameral	3,583,288	35.7	0.72	2,568,082	101	153	137	159	35,478	0.99	25,427
Mongolia	unicameral	2,953,190	27.1	0.61	1,805,586	76	143	122	141	38,858	1.32	23,758
Montenegro	unicameral	650,036	39.2	0.76	493,722	81	87	79	90	8,025	1.23	6,095
Morocco	bicameral	32,987,206	28.1	0.62	20,572,277	395	321	274	326	49,605	0.25	52,082
Mozambique	unicameral	24,692,144	16.9	0.49	12,013,562	250	291	229	271	98,769	0.40	48,054
Namibia	bicameral	2,198,406	22.8	0.56	1,228,384	96	130	107	124	22,433	1.39	17,061
Nepal	unicameral	30,986,975	22.9	0.56	17,352,264	601	314	259	307	51,559	0.17	28,872
Netherlands	bicameral	16,877,351	42.1	0.80	13,418,034	150	257	238	281	75,010	0.67	89,454
New Caledonia	unicameral	267,840	31.1	0.66	176,873	54	64	56	64	4,960	1.85	3,275
New Zealand	unicameral	4,401,916	37.6	0.74	3,257,167	120	164	148	173	—	0.83	27,143

Table B.1 (Continued)

Country	Type of Legislature	Population	Median age	% eligible pop	Eligible Population	Lower House (existing)	OSL_p	$\sqrt[3]{VAP}$	OSL_a	Population/Seats	% Population /Seat	Electorate / Seat
Nicaragua	unicameral	5,848,641	24.2	0.58	3,368,234	92	180	150	175	63,572	1.09	36,611
Niger	unicameral	17,466,172	15.1	0.46	8,113,005	113	259	201	237	154,568	0.88	71,797
Nigeria	bicameral	177,155,754	18.2	0.50	89,011,624	360	562	446	539	377,731	0.28	247,255
Norway	unicameral	5,147,792	39.1	0.76	3,903,601	169	173	157	184	30,460	0.59	23,098
Oman	bicameral	3,219,775	24.9	0.58	1,881,861	84	148	123	143	20,773	1.19	22,403
Pakistan	bicameral	196,174,380	22.6	0.56	109,134,390	342	581	478	578	439,853	0.29	319,106
Panama	unicameral	3,608,431	28.3	0.63	2,259,211	71	153	131	153	50,823	1.41	31,820
Papua New Guinea	unicameral	6,552,730	22.4	0.55	3,629,326	111	187	154	180	59,034	0.90	32,697
Paraguay	bicameral	6,703,860	26.8	0.61	4,074,133	80	189	160	187	53,631	1.25	50,927
Peru	unicameral	30,147,935	27	0.61	18,395,604	130	311	264	314	231,907	0.77	141,505
Philippines	bicameral	107,668,231	23.5	0.57	61,083,520	287	476	394	474	346,200	0.35	212,835
Poland	bicameral	38,346,279	39.5	0.76	29,265,989	460	337	308	368	68,475	0.22	63,622
Portugal	unicameral	10,813,834	41.1	0.78	8,464,961	230	221	204	240	47,017	0.43	36,804
Puerto Rico	bicameral	3,620,897	38.7	0.75	2,728,017	51	154	140	163	—	1.96	53,491
Qatar	unicameral	2,123,160	32.6	0.68	1,441,058	45	129	113	131	47,181	2.22	32,024
Romania	bicameral	21,729,871	39.8	0.77	16,664,104	412	279	255	303	36,956	0.24	40,447
Russia	bicameral	142,470,272	38.9	0.76	107,687,245	450	522	476	576	231,283	0.22	239,305
Rwanda	bicameral	12,337,138	18.7	0.51	6,274,290	80	231	184	217	116,388	1.25	78,429
Saudi Arabia	unicameral	27,345,986	26.4	0.60	16,485,055	150	301	255	302	182,307	0.40	109,900
Senegal	unicameral	13,635,927	18.4	0.50	6,884,735	150	239	190	224	90,906	0.67	45,898
Serbia	unicameral	7,209,764	41.9	0.79	5,714,340	250	193	179	210	28,839	0.40	22,857
Sierra Leone	unicameral	5,743,725	19	0.51	2,942,177	124	179	143	167	46,320	0.81	23,727
Singapore	unicameral	5,567,301	33.8	0.69	3,860,497	87	177	157	183	63,992	1.15	44,374
Slovakia	unicameral	5,443,583	39.2	0.76	4,134,565	150	176	161	188	36,291	0.67	27,564
Slovenia	bicameral	1,988,292	43.5	0.81	1,614,832	90	126	117	136	15,295	1.11	17,943
Solomon Islands	unicameral	609,883	21.6	0.54	331,819	50	85	69	79	18,064	2.00	6,636
Somalia	bicameral	10,428,043	17.7	0.50	5,175,723	275	218	173	203	31,696	0.36	18,821
South Africa	bicameral	48,375,645	25.7	0.59	28,747,872	400	364	306	366	98,726	0.25	71,870
South Sudan	bicameral	11,562,695	16.8	0.49	5,611,486	332	226	178	209	30,269	0.30	16,902
Spain	bicameral	47,737,941	41.6	0.79	37,660,988	350	363	335	401	78,646	0.29	107,603

Table B.1 (Continued)

Country	Type of Legislature	Population	Median age	% eligible pop	Eligible Population	Lower House (existing)	OSL_p	$\sqrt[3]{VAP}$	OSL_a	Population/Seats	% Population /Seat	Electorate / Seat
Sri Lanka	unicameral	21,866,445	31.8	0.67	14,627,328	225	280	245	290	97,184	0.44	65,010
Sudan	bicameral	35,482,233	19.1	0.51	18,218,927	450	329	263	313	70,964	0.22	40,487
Suriname	unicameral	573,311	28.6	0.63	361,051	51	83	71	81	11,241	1.96	7,079.43
Swaziland	bicameral	1,419,623	21	0.54	761,948	65	112	91	105	14,943	1.54	11,722
Sweden	unicameral	9,723,809	41.2	0.78	7,623,604	349	213	197	232	27,862	0.29	21,844
Switzerland	bicameral	8,061,516	42	0.79	6,399,294	200	201	186	218	32,770	0.50	31,996
Syria	unicameral	17,951,639	23.3	0.56	10,140,567	250	262	216	256	71,807	0.40	40,562
Taiwan	unicameral	23,359,928	39.2	0.76	17,742,571	113	286	261	310	206,725	0.88	157,014
Tajikistan	bicameral	8,051,512	23.5	0.57	4,567,872	63	200	166	194	83,005	1.59	72,506
Tanzania	unicameral	49,639,138	17.4	0.49	24,454,959	357	368	290	346	139,045	0.28	68,501
Thailand	bicameral	67,741,401	36.2	0.72	48,963,773	500	408	366	439	104,218	0.20	97,928
Timor-Leste	unicameral	1,201,542	18.5	0.51	608,125	59	106	85	97	—	1.69	10,307
Togo	unicameral	7,351,374	19.6	0.52	3,819,679	91	194	156	183	80,784	1.10	41,974
Trinidad & Tobago	bicameral	1,223,916	34.4	0.70	857,682	41	107	95	109	16,999	2.44	20,919
Tunisia	unicameral	10,937,521	31.4	0.66	7,262,981	217	222	194	228	50,403	0.46	33,470
Turkey	unicameral	81,619,392	29.6	0.64	52,400,230	550	434	374	449	148,399	0.18	95,273
Turkmenistan	unicameral	5,171,943	26.6	0.61	3,130,479	125	173	146	171	41,376	0.80	25,044
Uganda	unicameral	35,918,915	15.5	0.47	16,860,159	375	330	256	304	95,784	0.27	44,960
Ukraine	unicameral	44,291,413	40.6	0.78	34,399,769	450	354	325	389	98,425	0.22	76,444
UAE	unicameral	5,628,805	30.3	0.65	3,661,968	40	178	154	180	140,720	2.50	91,549
United Kingdom	bicameral	63,742,977	40.4	0.77	49,351,128	650	399	367	440	44,576	0.15	75,925
United States	bicameral	318,892,103	37.6	0.74	235,961,998	435	683	618	754	596,060	0.23	542,441
Uruguay	bicameral	3,332,972	34.3	0.70	2,331,562	99	149	133	154	25,837	1.01	23,551
Uzbekistan	bicameral	28,929,716	27.1	0.61	17,687,690	150	307	261	309	115,719	0.67	117,918
Venezuela	unicameral	28,868,486	26.9	0.61	17,579,572	165	307	260	309	174,961	0.61	106,543
Vietnam	unicameral	93,421,835	29.2	0.64	59,520,015	500	454	390	470	186,844	0.20	119,040
Yemen	bicameral	26,052,966	18.6	0.51	13,217,847	301	296	236	280	63,235	0.33	43,913
Zambia	unicameral	14,638,505	16.7	0.48	7,086,286	158	245	192	226	92,649	0.63	44,850
Zimbabwe	bicameral	13,771,721	20.2	0.53	7,256,765	270	240	194	228	39,348	0.37	26,877
yanmar	bicameral	55,746,253	27.9	0.62	34,629,334	440	382	326	390	83,955	0.23	78,703

Appendix C

Seat allocation methods commonly used in national legislative elections

This appendix very briefly introduces seat allocation methods commonly used in the electoral systems of the countries which are included in this research. These methods include (1) the largest remainder method (LRM), the highest average method (HAM), and (3) plurality methods. This appendix uses a hypothetical 19-seat legislature with a given distribution of votes among 7 parties and shows how different formulas yield different distributions of the seats.

C.1 Largest remainder method (LRM) (≈ Hare-Niemeyer method ≈ Hamilton method)

The Hare-Niemeyer method is the best possible allocation of seats in terms of achieving seat-vote proportionality (Niemeyer & Niemeyer 2008). This method initially allocates as many seats to the parties as the number of whole quotas in their vote. Quota is defined as below:

$$\text{Number of votes per every seat} = \text{Hare Quota} = \frac{V}{S}$$

Then the remaining seats are allocated to the parties which have a larger fraction of the quota in the remainder of their vote until all seats are filled.

In our example:

$$\text{Hare quota} = \frac{11,593,616}{19} = 610,190.32$$

Table C.1 shows the seat allocation process.

Table C.1

The seat allocation method using the Largest Remainder formula

Party	Vote	Step 1		Step 2		Step 3
		#quota in the vote	Initial allocation	Fraction of quota in the party vote	Complementary seat allocation	Total seats
A	5,380,426	8.82	8	0.82	1	9
B	1,680,814	2.75	2	0.75	1	3
C	1,559,833	2.56	2	0.56		2
D	981,893	1.61	1	0.61	1	2
E	961,136	1.58	1	0.58		1
F	589,061	0.97	0	0.97	1	1
G	440,453	0.72	0	0.72	1	1
Total	11,593,616		14		2	19

1. Full Hare quota allocated

5 more seats are yet to be allocated

2. Remaining seats go to parties with largest remainders

C.2 Highest Average Methods (HAM)

Also known as divisor methods, these methods divide the vote of the parties to a sequence of numbers to form a table. Using that table, the seat allocation starts from the party with the

largest number in its row. 1 seat is allocated to the party and the cell with the largest number is dropped from the table. The process is repeated until all seats are filled (Tables C.2, C.4 and C.5).

C.2.1 D'Hondt method ($\approx$ Jefferson method)

This method produces highest disproportionality among the HAM electoral formulas. In addition, it has the highest seat bias in favour of larger parties (Schuster et al. 2003).

D'Hondt method uses the sequence of positive integer numbers to calculate its quotients (Brams 2008, 219).

$$D'Hondt\ divisors = \{1, 2, 3, \dots, S\}$$

$$D'Hondt\ Quotient = \frac{V_i}{s+1}, \quad 0 \leq s \leq S$$

Table C.2 is used for the distribution of seats in our example. Parties associated with the largest numbers in the table are allocated seats until all seats are filled. The Green cells in table C.2 each denote a seat allocated to a party.

Table C.2

The seat allocation algorithm using the D'Hondt formula

Party	Vote	$\frac{V_i}{1}$	$\frac{V_i}{2}$	$\frac{V_i}{3}$	$\frac{V_i}{4}$	$\frac{V_i}{5}$	$\frac{V_i}{6}$	$\frac{V_i}{7}$	$\frac{V_i}{8}$	$\frac{V_i}{9}$	$\frac{V_i}{10}$	Total party seats
A	5,380,426	5,380,426	2,690,213	1,793,475	1,345,107	1,076,085	896,738	768,632	672,553	597,825	538,043	10
B	1,680,814	1,680,814	840,407	560,271	420,204	336,163	280,136	240,116	210,102	186,757	168,081	3
C	1,559,833	1,559,833	779,917	519,944	389,958	311,967	259,972	222,833	194,979	173,315	155,983	3
D	981,893	981,893	490,947	327,298	245,473	196,379	163,649	140,270	122,737	109,099	98,189	1
E	961,136	961,136	480,568	320,379	240,284	192,227	160,189	137,305	120,142	106,793	96,114	1
F	589,061	589,061	294,531	196,354	147,265	117,812	98,177	84,152	73,633	65,451	58,906	1
G	440,453	440,453	220,227	146,818	110,113	88,091	73,409	62,922	55,057	48,939	44,045	0
Total	11,593,616											19

The D'Hondt outcome may be arrived at by using the Hagenbach-Bischoff or Droop quotas as well (Balinski & Young 1982). The process is similar to Hare-Niemeyer allocation.

$$Hagenbach - Bischoff\ quota = Droop\ quota = \left\lceil \frac{V}{S+1} \right\rceil = \text{int} \left(1 + \frac{V}{S+1} \right)$$

Where S is the legislature size and V is the total number of votes. In our example:

$$Hagenbach - Bischoff\ quota = \left\lceil \frac{11,593,616}{19+1} \right\rceil = 579,680.8$$

C.2.3 Modified Sainte-Laguë Method

This method is identical to the Sainte-Laguë method except in its first divisor which is 1.4 instead of 1.

$$\text{modified Sainte - Laguë Quotient} = \begin{cases} \frac{V_i}{1.4} & \text{if } s = 0 \\ \frac{V_i}{2s + 1} & \text{if } 0 < s \end{cases}$$

Table C.5 shows the distribution of the seats in our example. Cells in green denote a seat allocated to a party. Parties associated with the largest numbers in the table are allocated seats until all seats are filled. The Green cells in table C.5 each denote a seat allocated to a party.

Table C.5

The seat allocation algorithm using modified Sainte-Laguë formula

Party	Vote	$\frac{V_i}{1.4}$	$\frac{V_i}{3}$	$\frac{V_i}{5}$	$\frac{V_i}{7}$	$\frac{V_i}{9}$	$\frac{V_i}{11}$	$\frac{V_i}{13}$	$\frac{V_i}{15}$	...	$\frac{V_i}{39}$	Total party seats
A	5,380,426	3,843,161	1,793,475	1,076,085	768,632	597,825	489,130	413,879	358,695	...	283,180	8
B	1,680,814	1,200,581	560,271	336,163	240,116	186,757	152,801	129,293	112,054	...	88,464	3
C	1,559,833	1,114,166	519,944	311,967	222,833	173,315	141,803	119,987	103,989	...	82,096	2
D	981,893	701,352	327,298	196,379	140,270	109,099	89,263	75,530	65,460	...	51,679	2
E	961,136	686,526	320,379	192,227	137,305	106,793	87,376	73,934	64,076	...	50,586	2
F	589,061	420,758	196,354	117,812	84,152	65,451	53,551	45,312	39,271	...	31,003	1
G	440,453	314,609	146,818	88,091	62,922	48,939	40,041	33,881	29,364	...	23,182	1
Total	11,593,616											19

C.3 Plurality methods

C.3.1 Block Voting

C.3.1.1 Multiple Non-Transferable Vote (MNTV) aka Plurality-at-large voting: voters choose m candidates in a k-seat district and the first k most popular candidates are elected when $k > 1$ and $m = k$.

Partial Block Voting (aka Limited Vote (LV)): voters vote for m candidates in a k-seat district when $k > 1$ and $m < k$.

Single-non-Transferable-Vote (SNTV): voters vote for 1 candidate ($m = 1$) in a k-seat district when $k > 1$.

C.3.1.2 Party Block Voting (PBV), (aka general ticket): is the party-list version of the bloc vote. In a k member MMD, each party nominates k candidates (a block or slate). Voters vote for a party or in other words choose all their candidates from a single party list. A party that wins a plurality of the votes, wins all the seats. If the entire country is a unitary electoral district, this can produce a landslide, and opposition or minority representation will be whipped out. So, the full at-large party block vote is considered completely anti-democratic, and is only used to elect portions of an assembly (Schwartz 2003, 75).¹⁰¹

¹⁰¹ FPTP may be understood as a special case of PBV too when size of the district is equal to 1.

C.3.1.3 Preferential Block Voting: is the instant-runoff version of MNTV. Voters rank candidates on their ballot paper. Candidates with the smallest tally of the first preference votes are eliminated until a candidate has more than half of the vote. The count is repeated with the elected candidates removed and all votes returning to full value until the required number of candidates is elected.

C.3.1.3.1 Full preferential voting: preferential block voting when voters rank all candidates

C.3.1.3.2 Optional preferential voting: preferential block voting when voters vote for as many candidates as they wish

C.3.2 First-Part-the-Post (FPTP): voters vote for one candidate in a single-member district and candidate with the highest vote is elected. FPTP may be interpreted as the application of SNTV or PBV to a single-member district depending on the structure of the ballot (whether voters vote for candidates (SNTV) or parties (PBV)).

C.3.3 Alternative Vote (AV): is the application of Preferential Block Voting in single-member districts.

C.3.3.1 Full Alternative Vote: voters should rank order all candidates

C.3.3.2 Limited Alternative Vote (LAV): voters rank 1+x candidates instead of all candidates

C.3.4 Two-Round-System (TRS): may be used with MNTV and PBV when absolute majority is required for candidates to win in the election and they fail to win a majority of votes in the first round. In this case a fewer number of more popular candidates proceed to the second round and may win the election with a simple majority (i.e. plurality) of the votes.

C.3.5 Binomial: voters vote for one electoral list in a double-member district (and they may rank candidates on the list but this does not affect the allocation of seats to parties). Votes are tallied and depending on the electoral formula either both seats always go to the first list (PBV) or the first two lists get one seat each (SNTV) or depending on the ratio of the vote of the first two lists one of this outcomes happen some of the times (Hare-Niemeyer, Sainte-Laguë, Modified Sainte-Laguë and D'Hondt).

Appendix D

Sample syntax of simulation program used to measure disproportionality (system used in Togolese general election 2013)

Coding language: Python

```
# Togolese general election 2013
# 91 MPs allocated to provinces by D'Hondt method (no national levelling).
# ~~~~~
import numpy as np, modules, math
participation_rate = .90 # participation rate = 90%
V9 = .98 # % vote cast for parties that enter the
parliament
threshold = .00 # electoral threshold
# ~~~~~
d_pop = np.array([[49548,65389,77446,154835,129507,60158,40558,38776,24614,
41556,55619,83838,91859,60960,63785,54149,80046,148908,
110834,21590,46534,57457,30741,102455,158918,120964,
54582,92323,79320,868348]]) # registered voters per district
(VEP = 3,065,617)

d_voters = np.round(d_pop * participation_rate) # actual voters per district
d_voters9 = np.round(d_pop * participation_rate * V9) # actual voters for the first
9 parties per district
districts = np.shape(d_pop)[1] # number of districts

electorate= np.sum(d_pop) # total voting eligible population
voters = np.sum(d_voters) # total voters
voters_9 = np.sum(d_voters9) # vote cast for parties that
enter the parliament
# ~~~~~
parties = 9 # parties that make it to the
parliament
OSLa = max(int(round(math.pow(electorate,(1/2.91)))),91) # optimal size of the
legislature = 169
seats = np.array([[2,3,3,4,3,3,2,2,2,2,3,3,3,3,3,3,3,4,3,2,2,3,2,3,4,3,2,3,3,10]])
# actual allocation of the seats
(total= 91)

# ~~~~~
sample = 10000 # Sample size
Da = 0.0
# ~~~~~
V = modules.data_call("normal_sample.csv",voters_9) # importing matrix of voting
outcomes
for m in range(sample):
    S = np.zeros((1,parties), dtype=np.int32) # final vector of seat
allocation
    VV= np.array([V[m,:]],dtype=np.int64)
    v = np.zeros((districts,parties), dtype=np.int64) # local matrix of votes
    v = modules.breakdown(VV,d_voters9,parties) # breaking results into
electoral districts
    for i in range(districts): # local allocation of seats to parties
using D'Hondt method
        vx = np.array([v[i][:]])
        s = modules.Hagenbach_Bischoff(vx,seats[0][i],parties)
        S = np.add(S,s)
        S = S.astype(np.float)
        s_a = S/np.sum(S) # actual % seat share of the
parties
        S_pr = np.array(modules.Hare(VV,OSLa,parties),dtype=np.float)
        s_pr = S_pr/np.sum(S_pr) # proportional % seat share of
the parties
        Da += modules.dispr(s_a,s_pr) # calculating Da index
```

Appendix E

Calculation of *ENPP* for the Chilean binomial system

Traditionally, the Chilean party system has been highly fragmented both on the left and on the right of the political spectrum. Since 1953, only once (1965) did a party manage to win an absolute majority of the seats in the parliament and historically the legislature has been split between at least 5 major parties with a comparable share of the seats. After the restoration of political democracy in Chile in 1989, one of the intentions behind the choice of the binomial system was to curb the over-fragmentation of the Chilean party system by making parties to bind together and eventually dissolve in broader parties in order to be able to win seats. However, this strategy proved to be largely unsuccessful in the 24 years of use of the binomial system. During this period parties forged pre-election pacts to divide the constituencies between themselves and avoid within-coalition rivalry (something very detrimental to the chances of winning district seats in a binomial system).¹⁰²

However, rather than evolving into broader parties, these pre-election pacts simply turned into fortified agreements between parties to split the constituencies among themselves and effectively setting quotas of seats for the coalition partners. While the number of these electoral coalitions dwindled over time, their structure transformed into solid joint ventures between participating partners. As such, although the effective number of parties in the parliament during the binomial era may look to be as high as in proportional systems, in reality this situation by no means corresponds to a competitive politics. On the one hand, binomial system pushed parties to retrench their constituencies in geographically exclusive districts and minimize competition especially with parties with similar ideologies/agendas in their strongholds. On the other hand, once elected to parliament, unlike proportional systems parties had little room to bargain or pose a credible threat of leaving out of the coalition because doing so would be synonymous with being expelled from the coalition in the next election and losing parliamentary representation. As such, the livelihood and versatility of politics manifest in proportional systems with high levels of electoral competitiveness and the contingent nature of post-election coalition building and maintenance were largely absent under the binomial system in Chile.

This implies that although pre-election coalitions were still internally fragmented, the constituent parties of these coalitions were not effectively independent in their electoral and parliamentary existence. For this reason, rather than using the vote and seat shares of the parties in parliament for the calculation of *ENPP*, we treated coalitions as single parties and took the collective vote and seat shares of their member parties for the calculation of *ENPP*.

¹⁰² Details of the operation of the binomial system were discussed at length in chapter 4.

Appendix F

Classification of countries based on the relation between *ENPP* and Gini over time

Table F.1

Classification of countries based on the relation between *ENPP* and Gini over time

	Africa	Asia	ex-USSR	Latin America	Eastern Europe	Western Europe, North America and New Zealand
very negative	Niger Burkina Faso Sierra Leone Benin Tanzania South Africa Botswana	South Korea Japan Bangladesh Sri Lanka	Kyrgyzstan Georgia	Honduras Guatemala Panama Bahamas Paraguay Colombia Brazil	Slovenia Poland	USA
negative	Togo	-	Moldova Latvia	Costa Rica Mexico Jamaica Trinidad & Tobago Guyana Peru	Croatia Czech Republic	Portugal Cyprus Spain Netherlands UK Iceland New Zealand
no pattern or mixed	Malawi Kenya	Pakistan	-	Barbados Uruguay	Serbia Montenegro	Italy Canada
positive	Nigeria Cape Verde Mozambique	-	Russia Lithuania	Belize Chile	Kosovo Albania Hungary	Austria Sweden
very positive	Liberia Ghana Madagascar Lesotho Zambia Namibia	Indonesia India	Armenia	Nicaragua El Salvador Bolivia Ecuador	Macedonia Bulgaria Slovakia	Germany Belgium Luxembourg Finland Denmark Norway