Income Inequality, Redistributional Spending & Director's Law – An Empirical Investigation

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Abstract

The link between income inequality and governmental redistribution is still subject to intense research and debate as it affects a wide range of issues in international and comparative political economy. Starting with the median-voter-hypothesis, a plethora of theoretical models have been developed during the last three decades to identify and explain possible causal relationships. The empirical evidence so far, however, has been mixed. The aim of this paper is to review the existing literature on inequality and redistribution, to explicate the theoretical causal mechanisms identified so far, and to provide a comprehensive, rigorous empirical test that overcomes some of the shortcomings of previous empirical studies. It extends the literature by using more precise measures of redistribution. Using panel data on 23 OECD countries over the time period of 1971–2005, we find robust evidence that income inequality is indeed associated with more redistribution. Most importantly, we find evidence for Director's law: income is redistributed from the rich *and* from the bottom 20 per cent of the income distribution towards the middle class.

KEYWORDS: redistribution, income inequality, median voter models, panel data
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1 Introduction

Income inequality and the political response it may engender is at the core of many policy issues in international and comparative political economy. It may affect a public's acceptance of free trade policies and exposure to further international market integration. It is also argued to affect economic development and growth both directly and through the redistributive policies that may result from increasing inequality. Understanding the nexus between inequality and redistributional responses by the government is therefore a key factor when analyzing many of the questions political economists are concerned with.

Over the last three decades, a large amount of literature trying to explain the relationship between redistribution and (income) inequality has been developed. Diverse theoretical mechanisms relating redistribution and inequality have been proposed. Often, the theoretical results are derived from median voter models in the vein of Meltzer and Richard (1981), Romer (1975) and Roberts (1977) or one of their extensions. The general conclusion is that redistribution increases with a rising mean to median income ratio, and so does redistributive government taxation. However, not all models predict that redistribution runs from rich to poor as predicted by the median voter approach. By contrast, focusing on the insurance motives of public transfer spending, Moene and Wallerstein (2003) predict a negative relation between income inequality and redistribution, implying that redistribution runs from poor to rich. Furthermore, some authors find support for Director's Law which insinuates that redistributive politics favor the middle class at the expense of both the rich and the poor (Stigler (1970), Dixit and Londregan (1998), Epple and Romano (1996)).

On the empirical side there are no clear cut results, either. While some authors find empirical evidence for a positive relationship between redistribution and inequality (Alesina and Rodrik (1994), Persson and Tabellini (1994), Milanovic (2000)), others do not find evidence in support of the median voter model (e.g., Perotti (1996)). This has led some to believe that there exists

no robust empirical relationship. Many of the existing studies, however, only look at different types of expenditures as dependent variables. Others do not bother to look beyond a coarse summary indicator like the Gini coefficient, therefore missing different dynamics at the lower or higher end of the income ladder. Still others use only gross or even disposable income instead of factor income to derive inequality measures. Finally, some results are mainly driven by poor data quality of the inequality measures.

Against this background, the aim of this paper is twofold: First, to survey the main causal mechanisms between inequality and redistribution and to provide an overview of the existing evidence. Secondly, to provide a comprehensive empirical test of the main hypotheses with more precise measures of redistribution using the high quality data of the Luxembourg Income Study (LIS). Ultimately, we are interested in analyzing what kind of redistributive response is engendered by increasing income inequality and which income groups stand to benefit and which to loose in the process.

Analyzing panel data of 23 OECD countries over the time period of 1971–2005, we find that income inequality is clearly and positively associated with redistribution. We look not only at different spending categories but also at the share gains of different income deciles. Overall, it clearly emerges that the main driver behind redistribution is not so much general inequality as measured by the Gini coefficient, but the ratio of (factor) income between the top income decile and the middle class. Most importantly, we also find confirming evidence for Director's law. Redistribution is not only driven by the income disparity between the middle classes and the top 10 per cent, it also runs from ends to the middle. Hence, income is redistributed from the rich *and* from the bottom 20 per cent of the income ladder towards the middle classes. Our results survive a large number of robustness tests and underline the pivotal role of the middle classes.

The remainder is structured as follows. Section 2 reviews the main theoretical mechanisms and presents the empirical evidence relating inequality and redistribution. Subsequently, section 3 introduces the econometric

framework used in the paper, discusses the results of the empirical analysis and provides robustness checks. Finally, section 4 concludes.

2 From Income Inequality to Redistribution – A Review of the Literature

The aim of this section is to establish hypotheses relating inequality to redistribution. On the one hand, we will illustrate the theoretical mechanisms of how inequality is transmitted into different levels of redistribution. Yet, on the other hand, we will also survey the empirical literature. In order to clarify the different predictions of the models, this section is structured according to the main results concerning the direction of the redistribution process.[1] It starts with models predicting a redistribution running from the top to the bottom (section 2.1), followed by a reverse relationship (section 2.2) and subsequently presents those models deriving a redistribution from the ends to the middle of the income distribution (section 2.3). Finally, the main hypotheses are summarized in section 2.4.

2.1 Redistribution Runs from the Top to the Bottom of the Income Distribution

The Meltzer-Richard Logic and Some Extensions

One of the perhaps most influential political economy models linking inequality and redistribution goes back to Meltzer and Richard (1981), Romer (1975) and Roberts (1977) and is often referred to as the Meltzer-Richard model. In a general equilibrium model in which the only government activities are taxation and redistribution, they show that the equilibrium tax rate depends on the ratio of median to mean income. Voters whose income exceeds that of the pivotal (median income) voter favor lower taxes and less

[1]For a similar structure with a focus on voting models, see Borck (2007).

redistribution, while voters with an income below that of the pivotal voter support higher taxes and more redistribution. Given a log-normal income distribution, an increasing gap between the median and mean income implies increasing inequality and, according to the Meltzer-Richard logic, results in a rise in redistributive taxation. As a consequence, the model purports that an increase in redistribution is linked to a falling median to mean income ratio.

There are several extensions of this basic theoretical setting which are excellently surveyed by Borck (2007). Tridemas and Winer (2005), for example, use a spatial voting framework in which not only the first moment, but all three moments of the distribution of income matter. They show that the predictions are far less clear-cut in this setup.

The empirical literature dealing with the Meltzer-Richard voting model hypothesis and its extensions offers mixed results. Quite surprisingly, to the best of our knowledge only Gouveia and Masia (1998) directly test the median to mean ratio hypothesis. Using panel data from the US states from 1979-1991, they find little evidence to support the model. Perotti (1996) and Kenworthy and McCall (2008) also do not find supporting evidence. By contrast, using micro-data from the Luxembourg Income Study, Milanovic (2000) finds evidence for the median-voter model. Similar positive results have previously been found by Gouveia and Masia (1998), Alesina and Rodrik (1994) and Persson and Tabellini (1994).

There are several possible explanations for these differences. One reason is that some papers use data for disposable income (i.e., income *after* government redistribution), whereas the Meltzer-Richard model postulates a relationship for factor income, i.e., *before* taxation and redistribution has taken place (see Milanovic (2000) for a critique of this practice). Additionally, it has been rightly criticized that some of the studies use poor proxies for redistribution, such as social security transfers or unemployment benefits in percent of GDP (Bassett, Burkett, and Putterman (1999)). Thus, a misspecification of the actual level of redistribution is results in an endogeneity

problem. Moreover, Bénabou (2000) stresses that the empirical support for the Meltzer-Richard model is weak because many authors do not take into account that the political participation increases with income, which means that the decisive voter has an income above the mean. According to this logic, redistribution is lower than it would be without voter abstention. A critique that is closely related to this argument is that one should incorporate the electoral turnout because it is positively related to the extent of government redistribution (most recently Mahler (2006)). Finally, due to party loyality of voters, candidates may choose a moderate redistributive platform in order to achieve other objectives (Harms and Zink (2003)), which again leads to different results than predicted by the median-voter hypothesis.

The (Endogenous) Fiscal Policy Channel

In a model that is closely related to Meltzer-Richard, the transmission mechanism between inequality and redistribution can be derived from the (endogenous) fiscal policy approach of Alesina and Rodrik (1994), Bertola (1993), Perotti (1993) and Persson and Tabellini (1994), and is often referred to when explaining the link between economic growth and inequality. The arguments are similar to the ones above. However, the relationship is now discussed within a new growth framework, as income distribution affects government activities and taxation, which in turn has an impact on growth.

In order to understand the transmission mechanism, consider a simple model where fiscal policy, which is established by majority voting, is a purely redistributive system where income is proportionally taxed and redistributed as a lump-sum to all individuals. As taxation is proportional to income, but the benefits of expenditure accrue equally to all individuals, the tax rate for an individual and the expenditure is inversely proportional to one's taxed income. Since this relation holds for the decisive (median) voter as well, the level of expenditure and taxation on the one hand and the median income on the other are negatively related. This negative relationship between income of the median voter and the level of expenditure and taxation via the political

(voting) process is what Perotti (1996) dubs the "political mechanism". The second mechanism describes the "economic mechanism", relating redistributive public expenditure and taxation to growth. Here, the model predicts a negative relationship mainly due to crowding out effects of private savings and investments. In sum, the endogenous fiscal policy approach creates a two-stage process: from higher income inequality to higher redistribution and from distortionary taxation to lower growth.

For our purpose, the political mechanism is of special concern. Generally speaking, the empirical evidence for this is rather mixed: Perotti (1996) as well as Persson and Tabellini (1994) find weak empirical evidence for the effects of income inequality and fiscal policy. Bassett, Burkett, and Putterman (1999) see more evidence for a positive relationship between the income share of the middle quintile and transfers. Tanninen (1999) in turn, does find empirical support for a positive relation between income inequality and growth.

Intergenerational Mobility

Another transmission mechanism between inequality and redistribution is suggested by the prospect of intergenerational mobility which is sometimes called the Prospect Of Upward Mobility (POUM) hypothesis. It claims that the unwillingness of the poor to support high levels of redistribution is motivated by their hope of becoming part of tomorrow's rich by means of social mobility (Alesina and La Ferrara (2005)). Therefore, this approach predicts a much more subdued relationship between inequality and redistribution than the Meltzer-Richard model. Recently, this hypothesis has been formalized by Bénabou and Ok (2001), who show that it is fully compatible with rational expectations and fundamentally linked to the concavity in the mobility process. However, investigating US data, Bénabou and Ok (2001) cannot find empirical evidence for the POUM hypothesis, suggesting that the POUM effect is probably dominated by the demand for social insurance.

Several other papers have attempted to empirically test the social mobility

hypothesis. Gardiner and Hills (1999) find mixed evidence for a UK sample. Using self-assessment measures of upward mobility in OECD countries, Corneo and Grüner (2002) conclude that the desire to obtain higher standards significantly shape individual preferences for redistribution. Moreover, Alesina and La Ferrara (2005) find evidence that the support for redistribution polices is negatively affected by expected future income. More recently, Mayer and Lopoo (2008) find that intergenerational mobility is greater in high spending US states than in low-spending ones.

2.2 Redistribution Runs from the Bottom to the Top

Insurance Motives

Moene and Wallerstein (2001, 2003) extend the Meltzer-Richard model by incorporating the fact that welfare expenditures (especially unemployment benefits, sickness pay) are not only redistributional but also provide insurance against income loss. They argue that, with increasing income, the demand for insurance rises while the demand for redistribution decreases. As a consequence, the increase of the income gap between median and mean income (i.e., a rise in inequality) has two counteracting effects: when the median voter's income falls, the demand for insurance decreases while the desire for redistribution increases. Assuming that relative risk aversion is large enough, the voter will demand less insurance, which attests to a negative relationship between inequality and spending on programmes that have a strong insurance character.

Moene and Wallerstein (2001, 2003) test their theoretical framework and find empirical evidence that higher levels of inequality in pre-tax earnings are associated with lower levels of spending on policies that insure against income loss of working persons.

Imperfect Asset Markets

Bénabou (2000) primarily attempts to uncover why countries with similar

preferences and technologies and equally democratic political systems have different systems of social insurance, fiscal redistribution and education finance. He develops a stochastic growth model in which the economy is populated by overlapping-generations and where heterogeneous agents vote over redistributive (fiscal or educational) policies.

Given the fact that asset markets, i.e., insurance and credit markets, are imperfect, there are redistributional policies (like social insurance) which have a positive net effect on output growth or ex ante welfare. This implies that redistribution, at least over some range, decreases with inequality. The intuition behind it is that in fairly homogenous societies, there is a wide consensus on efficient redistribution, whereas in unequal societies there is a strong opposition. Moreover, imperfect asset markets imply that lower redistribution causes an increase in inequality of future incomes due to wealth constraints on investment in human or physical capital. This results in a more persistent inequality. Furthermore, the model predicts a U-shaped relationship between inequality and redistribution in the short run and a negative correlation in the long-run.

Using a cross-section analysis for the time period 1981–1998, de Mello and Tiongson (2006) do indeed find positive evidence that countries with a higher inequality redistribute less. Moreover, their results also indicate a U-shaped relationship between inequality and redistribution as predicted by the model.

2.3 Redistribution Runs from the Ends to the Middle

Coexistence of Public and Private Provision of Goods

The provision of some goods is characterized by a coexistence of public and private provision. In this setup, which is often referred to as a dual-provision of goods, the tax revenues are used to fund public goods, while households are simultaneously free to opt out of publicly provided goods in favor of a private alternative. Reasonable examples are education or public insurance,

such as health or unemployment insurance.

The coexistence of public and private provision of goods has (unexpected) consequences concerning the preferences of the households. Using education policy as an example, Epple and Romano (1996) use a voting model to show that high income-households prefer a lower public school expenditure (and less taxation) because they care for private provision. Low-income households prefer a low expenditure for education as well, because they are less willing to substitute this public good for other goods, i.e. they prefer consumption and less taxation over public education provision. By contrast, middle-income households call for public schools so that they prefer higher public education spending. As a consequence, an equilibrium is characterized by a middle-income coalition preferring a higher public school expenditure versus a coalition of high- and low-income households preferring a lower expenditure. Assuming that the decisive voter is part of the middle class, the public spending leads to a redistribution which favors the middle class at the expense of both the rich and the poor. This setup is sometimes dubbed "Directors Law" (Stigler (1970)) or "ends-against-the-middle" conflict.

The Impact of Public Values and Ideology

Public values and ideologies are also expected to influence the relationship between inequality and redistribution. In the electoral competition model of Dixit and Londregan (1998), voters and parties care about inequality in addition to their private concerns for consumption or votes. Assuming that rich and poor voters prefer left and right politics while the middle class is not strongly attached to one party, they show that the middle class thrives in redistributive politics. Thus, party platforms reflect middle-class ideology. their transfer policies favor the middle class at the expense of the rich and the poor, which again points to the existence of the Director's law.

In contrast, extending the Meltzer-Richard setup by introducing unselfish voters with public values, Galasso (2003) comes to a different conclusion. In brief, he models voters who not only care for their own well-being, but who

also oppose inequality in society. Under this assumption, the relevance of the middle class is reduced. Thus, a rise in inequality between the poor and the middle class does not necessarily decrease redistribution because of the additional (voting) support for redistribution by the fair agents (of the middle class).

2.4 Formulation of Hypotheses

Against the background of the theoretical mechanisms presented in the previous subsections, the following hypotheses are derived:
Redistribution runs from the top to the bottom:
H1: Redistribution rises with increasing inequality, i.e., with decreasing median income (Perotti (1996)).
H2: Given log-normal income distributions, redistribution rises with a decreasing median to mean factor income ratio (Meltzer and Richard (1981)).
Redistribution runs from the bottom to the top:
H3: Due to the insurance character of public spending (e.g., unemployment and health insurance), increasing inequality leads to a decreaseing public spending (Moene and Wallerstein (2001, 2003)).
Redistribution runs (from the ends) to the middle:
H4: The middle class benefits the most from redistribution, i.e., redistribution runs from the ends towards the middle class (Stigler (1970)).

3 Empirical Analysis

In order to test the impact of different measures of income inequality on redistributional spending, we use an unbalanced panel of up to 23 OECD countries covering the time period 1971-2005.[2] The inequality measures and

[2]The countries are (available time periods in brackets): Australia (1981, 1985, 1989, 1994, 2001, 2003), Austria (1994, 2000), Belgium (1985, 1992, 1997), Canada (1975, 1981, 1987, 1991, 1994, 2000), Czech Republic (1992, 1996), Denmark (1987, 1992, 1995, 2000, 2004), Finland (1987, 1991, 1995, 2000, 2004), France (1979, 1984, 1989, 1994), Germany (1978,

some of the indicators of government redistribution are taken from the Luxembourg Income Study. There are only few alternative sources for comprehensive inequality datasets such as UNU-Wider's world income inequality database (UNU-WIDER (2005)) or the University of Texas Inequality Project. However, the LIS guarantees the highest data quality. It does not collect microdata, but rather harmonizes the national household income microdatasets, thereby ensuring the highest degree of internal consistency (for more detailed information about the unique contributions of LIS, see Atkinson (2004), Förster and Vleminckx (2004)).

The LIS publishes new country data approximately every 5 years so that we generate seven 5-year averages beginning in 1971-1975 up to 2001-2005. We follow the approach of Carter (2006) and allocate the LIS data to the nearest/closest end of the five-year period.[3] The use of 5-year averages helps remove business cycle effects and enables us to examine medium- to long-term relationships. Given our research focus this constitutes an advantage, since we doubt that annual changes of income inequality automatically influence the extent of redistribution. First, there is bound to be a lag in recognition, i.e., before households/voters actually notice that their *relative* income position has changed. Second, elections do not take place annually, so there might not be an immediate outlet for voters to express possible changes in their preferences for government policies.[4] Finally, choosing 5-year averages

1981, 1984, 1989, 1994, 2000), Greece (1995), Hungary (1991, 1994), Ireland (1987, 1990 (interpolated), 1995), Italy (1986, 1991, 1995), Luxembourg (1985, 1991, 1994, 2000, 2004), The Netherlands (1983, 1987, 1991, 1994, 1999), Norway (1979, 1986, 1991, 1995, 2000), Poland (1986, 1992, 1995, 1999), Slovak Republic (1992, 1996), Spain (1980, 1985 (interpolated), 1990, 1995), Sweden (1975, 1981, 1987, 1992, 1995, 2000), Switzerland (1982, 1985 (interpolated), 1992, 1995 (interpolated), 2000), UK (1974, 1979, 1986, 1991, 1995, 1999), USA (1974, 1979, 1986, 1991, 1994, 2000, 2004).

[3]To make this clearer, we allocate the LIS data for Australia in 1981 (1989) to the year 1980 (1990) and then calculate the 5-year averages from 1971-1975 up to 2001-2005.

[4]Of courses, there are other, more direct ways to influence public policy, such as lobbying and exerting interest group pressure. However, even if this is successful, it usually requires a considerable amount of time in a democracy to enact change.

has the additional advantage of increasing the comparability to the existing literature, since many studies also follow these lines (e.g., most recently by Carter (2006); Voitchovsky (2005)).

3.1 Variables and Definitions

We look at a wide range of indicators of government redistribution. Detailed definitions and sources for all dependent and independent variables are provided in Table 1 of the appendix. In addition, Table 2 provides the summary statistics, while Tables 3 and 4 show the pairwise correlation results. As will become apparent during the analysis, the results are strongly dependent on which aspect of governmental redistribution is actually under consideration. Different indicators measure quite different things, so that the theoretical mechanism linking it to inequality should differ.

There are, broadly speaking, two types of redistribution indicators. On the one hand, there are those that measure the amount that governments spend to reduce inequality, such as social spending in per cent of GDP. On the other hand are those that directly try to gauge the difference between factor and disposable income in different income percentiles. The majority of existing studies have gone the first route (e.g. Moene and Wallerstein (2003); Schwabish, Smeeding, and Osberg (2004)), but there are also some that have used the latter concept (e.g. Milanovic (2000); Iversen and Soskice (2006)). We examine both types of indicators to get a fuller picture and to determine to what extent the different findings in the literature can be attributed to differences in how redistribution is conceptualized.

In terms of spending indicators, we test first whether the size of government is sensitive to inequality by looking at overall government expenditures (**Gov. Exp.**). Then we proceed by looking at different measures of social expenditures, starting with the broadest one, social expenditures (**Social Exp.**), which includes all public social expenditure such as cash and in-kind transfers, social services, tax breaks with a social purpose etc. An alternative measure to these spending variables is the social transfer ratio (**Soctrans**

Ratio), which is the average ratio of social transfers to total disposable income[5]. This indicator has the advantage of measuring social transfers not at the aggregate budget level but rather at the individual level.

In addition, we also look at unemployment expenditures (**Unemp. Exp.**) which captures cash expenditures compensating for unemployment and health expenditures (**Health Exp.**) which measures the overall public spending on health care. Our intention is to test whether inequality also has the same impact on these types of social spending. As explicated in the literature review, Moene and Wallerstein (2001, 2003) argue that voters' could react quite differently to changes in inequality, depending on whether one considers programmes with a strong insurance character (e.g. unemployment and health) or purely redistributional ones such as social assistance.

These dependent variables are measured in per cent of GDP (**%GDP**) and in per cent of total government expenditure (**%Budget**). The reason we use both is that it might be possible that increasing inequality induces only a small change if measured in per cent of GDP, but that this effect is much more pronounced when related to the overall budget. In other words, the policy reaction might be much stronger than can be gauged by simply looking at the GDP-related figures. Note also that there are quite a number of country-years, where redistributional spending in terms of GDP dropped, while in terms of its budget share it actually increased and vice versa.

As mentioned above, we also consider indicators that directly measure gains in income through redistributional measures.[6] Thus, we calculate the gains/losses in the overall (household) income share when comparing disposable and factor income, that is we compare the income before and after redistribution took place. In addition to the existing literature, we use more precise measures of redistribution. In particular, we examine the share gains of the poorest decile (**SG Bottom-10**), of the two poorest deciles

[5]We use the square root scale to adjust the household income to the household size.

[6]Calculating the household income variables, we follow the LIS standard, i.e., we use the square root equivalence scale in order to adjust to household sizes. Furthermore, we top- and bottom coded the income data according to the LIS standard.

(**SG Bottom-20**), of the middle class ranging from the 2^{nd} to the 8^{th} (**SG Middle-80/20**)[7]and of the richest decile (**SG Top-10**) and the two richest deciles (**SG Top-20**) of the income distribution. These indicators are direct measures of redistribution and also capture the impact of tax breaks and allowances, as well as other forms of tax exempts that are not captured by spending variables. By distinguishing between various parts of the income distribution, it is possible to get a precise understanding of net winners and losers of redistribution and thus to investigate the existence of stable patterns such as proposed by Meltzer-Richard or insinuated by Director's law.

Turning to our independent variables, we are mainly interested in the effects of inequality on redistribution, using several inequality measures from the LIS database. We calculate them using factor income, which, according to the LIS definition, includes cash wages and salaries gross of employee taxes and social contributions, cash property income as well as earnings from farm- and non-farm self-employment. As an overall indicator of the distribution of income, we use the **Gini** coefficient. However, the Gini coefficient is too coarse to distinguish properly between the dynamics that might take place at the bottom or the top of the income ladder. Hence, we also investigate the inequality between the richest 10 per cent and the middle class, and between the poorest 10 per cent and the middle class. Thus, we calculate the ratios of factor income between the 90th and the 50th percentile (**P90/50**) and between the 50th and the 10th percentile (**P50/10**). Finally, since Meltzer-Richards type of models do not only look at the middle class in broad terms but explicitly identify the median income earner to be pivotal, we use the LIS dataset to calculate the median to mean ratio (**Median Mean Ratio**), which has been rarely tested before. This indicator decreases if the median income shrinks relative to the average income, and it goes up if the the distance between the median and the average income gets smaller.

[7]We tested also ranges for the middle class such as percentiles 20 to 50. However, our empirical results with respect to the direction of redistribution suggest that the the broader definition adopted here is more appropriate.

The control variables are chosen solely based on theoretical considerations and stay the same in all specifications. Of course, we extensively test whether our results are sensitive to our choice of these variables. As economic controls, we employ the real **GDP Growth**, the (standardized) unemployment rate (**Unemployment**) and, to take the impact of population aging into account, we use the ratio of people aged 65 and older to the total population (**Pop>65**).

In addition, we also introduce three political control variables that could, according to the literature, affect policy decisions on redistribution. First, there is a sizeable literature identifying the the role of government ideology on redistribution (Hibbs (1977), Hibbs (1987), Persson and Svensson (1989)). One link between partisan politics and redistribution results from the fact that the partisan theory of political competition assumes right-wing parties to represent higher-income voters and left-wing parties to represent lower-income voters. As a consequence, leftist governments are more engaged in redistribution towards the poor than rightist governments.[8] Hence, we employ a variable indicating the left's strength by measuring the share of cabinet seats held by left-wing parties (**Left Government**). Second, the literature assumes that a political outcome is influenced by the electoral system (for a very influential theoretical model see Austen-Smith (2000)). Under majoritarian (as opposed to proportional) regimes, the competition between parties focuses on some key marginal districts resulting in fewer public goods, less rents for politicians, more district targeted redistribution and a larger government. By contrast, under proportional representation politicians need to win the support of the broad majority, so that proportional regimes tend to have larger governments and a larger share of spending going to broad-based welfare programmes on public goods or welfare policy (Persson and

[8] A great number of studies have tested these hypotheses (see for example Cusack (1997), Hicks and Swank (1992)). In general, they have found support for the claim that the cabinet share of left-wing parties is positively associated with more redistribution. The effect of union power, in contrast, has been empirically less convincing (Bradley, Huber, Moller, Nilsen, and Stephens (2003)).

Tabellini (1999), Persson, Roland, and Tabellini (2000)).[9] As a consequence, to account for the potential impact of the electoral system (i.e., its degree of proportionality), we use a least squares index which has been proposed by Gallagher (1991) and has also become known as the Gallagher index.[10] The idea behind this index is quite simple: it measures an electoral system's **Disproportionality**, which is conceptualized as the difference between vote and seat shares of each party, weighted by the size of the deviations. Finally, we introduce **Voter Turnout** into our empirical specifications, since it has been argued that higher turnout is associated with more redistribution (for a very recent empirical test of that proposition, see Mahler (2006)).

3.2 Specification and Estimation

For each of our dependent variables we run panel regressions ($T = 7$ and $N = 23$),[11] using fixed effects estimation to account for unit heterogeneity. We deal with the problem of panel heteroskedasticity by employing White-Huber robust standard errors. Moreover, we test all specifications for the inclusion of time dummies. We decide on a case-by-case basis whether to introduce them into a regression equation, depending on the significance of a standard Wald test. In addition, we check all specifications for autocorrelation, using the Wooldridge test (Wooldridge (2002)). In cases where

[9] Empirical evidence strongly supports this hypothesis (see among others Persson, Roland, and Tabellini (2007) Persson and Tabellini (2004)). Similarly, Feld, Fischer, and Kirchgässner (2008) find empirical evidence for Switzerland that institutions of direct democracy are more efficient in the sense that they spend less for redistribution while simultaneously performing as well as representative democracies in reducing inequality. Moreover, Verardi (2005) demonstrates that inequality decreases with the increasing degree of proportionality of a system.

[10] We decided against using a simple dummy variable, which merely distinguishes between majoritarian and proportional systems because such a measure would be way too crude and would miss considerable differences that exist within each of the two categories. The Gallagher index is defined in Table 1.

[11] Note that a number of missings for different variables and different country-years effectively reduces the actual number of useable observations.

the Wooldridge test clearly rejects the null of no first-order autocorrelation, standard errors are specified to be robust not only to heteroskedasticity but also to autocorrelation, using the Bartlett kernel (Newey and West (1987)). Cross-sectional dependence could be another potential problem. Thus, in the robustness test section below, we also report our estimation results for standard errors that are robust to general forms of cross-sectional (spatial) dependence.

The generic set-up of our empirical analysis is a fixed-effects estimation

$$y_{i,t} = \beta_0 + \beta_1 \mathbf{z}_{i,t-1} + \beta_2 \mathbf{x}_{i,t} + \beta_3 \mathbf{w}_{i,t} + \mu_i + \eta_t + u_{i,t}$$

where the subscripts $i = 1, ..., N$ and $t = 1, ..., T$ denote country and year, $\mathbf{z}$ denotes the inequality variable(s), $\mathbf{x}$ and $\mathbf{w}$ are vectors of economic and political variables respectively, while μ_i and η_t stand for the inclusion of country and time dummies (if necessary) and $u_{i,t}$ is the disturbance term.

Note that reverse causality could pose a severe problem in the empirical analysis. Income inequality may affect the amount of redistribution, but at the same time redistribution has an immediate effect on income. Hence, there is the danger of capturing the influence of redistribution on inequality instead of the other way around. As it is hard to think of suitable exogenous instruments we try to solve this problem in the following way. We use Gini coefficients and percentile ratios that are calculated using factor income as defined in the previous sub-section. This is income *before* taxes have been raised and *before* redistribution by the state has taken place. Thus, social spending and taxation should have no direct impact on this type of income (see Milanovic (2000) and Schwabish, Smeeding, and Osberg (2004) for a similar argument). An indirect link, however, cannot be ruled out this way, since individual labour supply decisions are likely to be affected by the welfare state. According to standard theories, a higher degree of generosity of redistributional programmes induces households at the lower end of the income strata to reduce labour supply, thus lowering their factor income relative to higher income groups. To address this issue, we lag our inequality indicators by one period. Finally, in case of a still remaining endogeneity problem we

employ a two-step system GMM estimation proposed by Blundell and Bond (1998) in the robustness section.

3.3 Results

Table 5 presents the fixed effects estimation results for our first set of spending variables. Neither the Gini coefficient nor the two percentile ratios have a significant impact on overall government expenditures. This comes as no surprise, since many items in the government budget are not directly related to inequality (e.g. defense, government consumption and investment). Looking at social expenditures yields mixed results. When measured in per cent of GDP, the Gini variable is not significant, but increasing inequality between the poorest 10 per cent and the middle class (P50/10) seems to be negatively correlated with social expenditures. The same holds true when measuring this indicator as a share of the general budget. Yet in this case, the Gini variable is also significant. Taking the ratio of social transfers to disposable income as a dependent variable, we find that Gini is of a positive sign and clearly significant, suggesting a positive correlation, while P90/50 and P50/10 are not significant.

Since we are mainly interested in the interpretation of the inequality variables, we will refrain from discussing in detail the results for the economic and political controls. Let us just note that economic growth remains mostly insignificant, while unemployment has the expected positive and significant impact, except if spending is measured as a budget share. Population aging seems to have no significant effect on overall government spending. There is no clear pattern for the political control variables, but voter turnout seems to be positively associated with overall expenditures and negatively with social spending. Surprisingly, the strength of left-wing parties in government is negatively correlated with social expenditures, while the proportionality of the electoral system remains insignificant.

Insert Table 5 here.

In Table 6, we explicate the results for the two spending variables that do not only have a redistributional but also an insurance character. It has been argued in the literature that insurance programs follow a different logic and that rising inequality could be associated with less spending on these items (Moene and Wallerstein (2001), Moene and Wallerstein (2003)). The inequality coefficients on unemployment expenditure are indeed negative throughout, but they are not significant. The only significant variable is, unsurprisingly, the unemployment rate. With respect to health expenditures, we do not find any relationships that are significant at conventional levels.

Insert Table 6 here.

Next, we test whether it makes a difference to look at individual gains in income redistribution instead of merely looking at certain items of the government budget. We indeed find significant relationships that, surprisingly, differ depending on which part of the income ladder we are looking at. As is markedly shown in Table 7, when we only consider the share gain of the poorest 10 per cent of income earners, we find a strong negative impact of inequality as measured by the Gini coefficient, which is quite significant. A similar picture emerges, if we look at bottom 20 per cent: the Gini coefficient and P90/50 are both negative and significant. This picture changes when focusing on the share gains of the middle class (SG Middle-80/20). In this case, the Gini coefficient is strongly positive and significantly different from zero. Moreover, both P90/50 and P50/10 are also positive, although only the former is significant. This suggests that as the income gap widens between the middle and the top, redistribution towards the middle classes strongly increases. Interestingly, these results are observed mainly for a broad definition of the middle class that ranges from the 2^{nd} to the 8^{th} decile. Comparing the results of several regressions for different ranges of middle class definitions, we find that the main recipients of these increases in redistribution are indeed those in the 2^{nd} to 8^{th} decile-bracket. It is therefore clearly warranted to to define such a broad spectrum of the income distribution to belong to the 'middle class'.

Finally, looking at the share gains of the highest two income deciles, the coefficients for Gini and P90/50 turn negative again, being at conventional significance levels. These results insinuate that increasing income inequality raises redistribution towards the (broadly defined) middle class at the cost of both high and low income earners.

Insert Table 7 here.

All these findings are strongly confirmed if we re-run the regressions without lagging the inequality variables. Table 8 presents these results in the upper panel. For economy of space, the table only shows the coefficients and standard errors for the inequality variables. The estimation strategy as well as economic and political control variables remain the same as before. The Soctrans Ratio is positively related to rising inequality, while general social expenditures remain insignificant. Finally, we once again find that parameter signs switch from negative to positive and back, as we move along the distribution of income from the lower to the higher end.

Insert Table 8 here.

We also test whether the median income earner plays the pivotal role ascribed to her by the standard Meltzer-Richard models. Table 8 exhibits our corresponding results in the second panel. Interestingly, the coefficients are in all specifications far from being significant. This suggests that the difference between median and mean income does not affect the degree of redistribution.

3.4 Robustness Checks

To check the robustness of our results, we run a battery of regressions using various alternative estimators and standard error calculations. First, to test the robustness of our findings against another estimator, we also run all regressions using a feasible generalized least-squares method including country

dummies. Errors are assumed to follow a first-order autoregressive process and the Prais-Winsten method is used to estimate the autocorrelation coefficient. Second, we want to make sure that our results are not driven by the bandwidth we selected for the Bartlett-kernel. Thus, we calculate standard errors using the automatic covariance selection procedure introduced by Newey and West (1994) making our standard errors robust to both heteroskedasticity and serial correlation. Third, we repeat the analysis using standard errors that are robust to heteroskedasticity, serial correlation and general forms of spatial dependence. Our set of countries is a non-random sample of industrialized democracies, which could be subject to common influences affecting our variables of interest. Hence, we estimate standard errors employing a nonparametric covariance matrix estimation procedure as proposed by Driscoll and Kraay (1998). Fourth, we opt for additionally explicating the most important estimation results in detail for a sample that excludes the US using our standard fixed effects estimator. The reason is that the US is a country with a comparably high inequality and a relatively small welfare state. We want to make sure that this does not bias our results. Finally, we report our findings for the regressions on the whole country sample, but without the unemployment rate as a control variable. The case for leaving unemployment out of the specification could be made on the grounds of it being endogenous to redistribution. In other words, the generosity of welfare benefits should affect labour supply decisions and the labour market in general. Higher spending could lead to lower employment and higher unemployment, which could also bias our estimates for the inequality variables.

Insert Table 9 here.

To save space, Table 9 contains again only the coefficients and standard errors for Gini, P90/50 and P50/10. However, these are estimated using the same set of controls as in the previous regressions. As before, the Gini coefficient and the percentile ratios are in two separate specifications. We only took a subset of the, in our view, most important dependent variables into

consideration. A first look at Table 9 reveals that all our findings survive the use of different standard errors and estimators, although the size of the coefficients varies somewhat.[12] Soctrans Ratio and SG Middle-80/20 increase with rising inequality measured by Gini and P90/50, while the bottom and top 20 per cent of the income distribution a net losers. In addition, P50/10 becomes significant for some dependent variables. But it does not remain significant across all specifications, which is why we do not consider these as stable results[13]. However, there is a suggestion that overall social expenditures in per cent of GDP are negatively related to the income between the lowest income earners and the middle class. Dropping the variable 'Unemployment' or all observations for the US from the sample does not change the results substantively.

As mentioned in the beginning of the paper, endogeneity could still pose a problem in our empirical analysis. One way to control for this is to use an instrumental variable estimator combined with fixed effects or first-differences. However, there are no reasonable external IV available. Thus, identification will be based on internal instruments using the inequality variables (Gini, P90/50, P50/10), the GDP growth and the unemployment rates as instruments. We include them into a two-step system GMM approach proposed by Blundell and Bond (1998) to see whether our result still hold up. The consistency of the GMM estimators is based on large N. However, recent Monte Carlo simulations show that, given predetermined explanatory variables, the system GMM estimator has a lower bias and higher efficiency than the first differenced GMM or the fixed effects estimator (Soto (2006)). As the small N makes it not possible to use the full set of instrumental variables since the number of instruments must not exceed the number of countries, we include

[12]Different coefficient sizes for Newey-West and Driscoll-Kraay result from the fact that the test for the inclusion of time dummies mandated sometimes their inclusion for one of these two but not for the other.

[13]It has been found before that the Driscoll-Kraay standard errors are somewhat optimistic. Of course, it has to be noted that they rely on large T asymptotics, while in our panel $T < N$.

only the lagged variables in the levels equation and the first differenced variables in the differenced equation. Please note that we checked the robustness of our results by additionally using the second and / or third lag of the variables as instruments. This increases the number of instruments, however, it does not change the results substantially. Based on small panel size, Soto (2006) shows that using not all potentially available instruments does not decrease the reliability of the system GMM estimator. In order to prevent a downward bias of our results, in all of our system GMM estimations we use the finite-sample correction to the reported standard errors as proposed by Windmeijer (2005).

Insert Table 10 here.

The estimates in table 10 confirm our substantive conclusions, coefficient signs are the same as above and remain highly significant, with the only exception being the specification involving SG Bottom-20 as dependent variable.

Finally, we also check whether changing the institutional control variables would make a difference. We introduce **Federalism**, which indicates whether a country has a federalist structure. In addition, we also substitute our electoral system indicator **Disproportionality**, which is a continuous variable, with a dummy variable named **Plurality**. It indicates whether a country has a majoritarian system or not. We again use our standard fixed effects estimator.

Insert Table 11 here.

The results in Table 11 show that including these alternative institutional variables does not change any of our substantive findings. Even though the institutional variables are sluggish and could thus pose a problem for a fixed effects estimation, we arrive at the same significant results. Notably, Federalism and Plurality both have a negative and significant impact on redistribution towards the top and bottom 2 deciles of the income scale. However,

for the middle class the relationship is strongly positive. In other words, in more federalist systems with majoritarian electoral systems rising inequality leads to more redistribution for the middle class, but less redistribution to the lowest and highest 20 per cent of income earners. Since the impact of institutions on redistribution is not our main concern, we do not intend to dwell in depth on these results. The interactions between institutions and inequality and their impact on redistribution clearly demand further research.

Please note that we also test whether changing the income base for our inequality measures from factor to market income[14] would change our findings. Our substantive results, however, prove to be robust to this adjustment of definition. All our substantively interesting coefficients remain significant and of a similar magnitude. Finally, we also test the inclusion of further control variables. Thereupon, we introduce an openness indicator to capture possible effects of increased international integration. Additionally, we create a Maastricht dummy to isolate the effect the Maastricht convergence process could have had on European Union countries' redistributional spending. Both variables are neither significant nor did they change our results. In sum, the robustness tests strongly increase confidence in our results.

3.5 Interpretation of the Results

We are now in a position to relate our empirical findings to the hypotheses generated from the existing theoretical literature. The results lend support for the Meltzer-Richards model if broadly interpreted (Hypothesis 1). A higher overall income inequality seems to lead to more redistribution. Note that this conclusion is very much dependent on which indicator of redistribution one employs. Using overall government expenditure or social expenditures is not yielding any robust results. But this should not be taken to mean that the validity of this result is questionable. Rather, it cautions us that simply using expenditure variables is not a good way to capture re-

[14]Market income includes the same income categories as factor income, but in addition also contains public and private pensions.

distribution. Even analyzing social expenditures can me misleading, as it comprises of too many different types of programmes, some of which only have an indirect redistributive character (e.g. social services) and are very much path dependent. Reliance in the empirical literature on these types of indicators may partly explain the fragile and at times contradictory results. Thus, our analysis clearly highlights the need to use measures like the ratio of transfers to income or share gains.

With respect to the narrow version of the Meltzer-Richards model, which postulates that it is the relative income position of the median income earner that drives redistribution (Hypothesis 2), we do not find any statistically convincing evidence. Our variable Median/Mean remains insignificant across all specifications. As our positive and highly significant results for SG Middle-80/20 underline, it is rather a broad middle class that is decisive. Moreover, given the well known empirical phenomenon that voter turnout is increasing with income, we would expect the median voter to be more to the right on the income scale anyway. Therefore, this lack of statistically robust results does not mean, as is often insinuated, that there is no relation between inequality and redistribution. Instead of hunting for the elusive median income voter, one should rather identify the middle class in broader terms.

Our results for public spending categories with an insurance character (unemployment and health expenditures) are sobering. According to Hypothesis 3, we would expect these variables to decrease with rising inequality. We do find some significant negative effects of inequality on unemployment spending only, if it is measured in percent of the budget. With regard to health spending, we do not arrive at any robust results. Therefore, even though most of the regressions return the hypothesized negative coefficients, the results do not seem very significant. Since we approach statistical findings rather conservatively, we cannot confirm Moene and Wallerstein's (2001, 2003) results with any confidence. The jury is still out on this one.

Analyzing share gains for low income earners as well as the middle class allows us to analyze the validity of Director's Law, which, in a nutshell,

maintains that redistribution runs from the ends to the middle (Hypothesis 4). We indeed see strong evidence for this in our data. When overall inequality as measured by the Gini coefficient rises, then the lowest 20 per cent of the income ladder actually suffer a reduction in redistribution. The main driving force seems to be disparity between the highest income earners and the middle classes. If the latter see their relative income fall relative to the highest 10 per cent, they receive more redistribution at the cost of the poorest 2 deciles. The same relationship can be found for the top two deciles: increasing inequality, especially between the middle class and top income earners, engenders increased transfers to the former at the cost of the latter. This pattern of negative coefficients at the fringes and positive ones for the middle of the income distribution is extremely robust and survives all of our robustness tests. These findings thus offer strong empirical support for those variants of the Meltzer-Richard model that predict a redistribution of income from the poor and the rich towards the middle classes (e.g., Dixit and Londregan (1998)). Hence, our analyses clearly offer empirical support for Director's Law (Stigler (1970)).

4 Conclusions

The aim of this paper has been to survey the existing literature on inequality and redistribution, to identify the theoretical causal mechanisms linking these two, and to provide a comprehensive, rigorous empirical test. We have shown the existence of a plethora of theoretical models that offer different hypotheses about the relationship between income and redistribution – yet, empirical results have been mixed, if not contradictory. This has led some to doubt the existence of a robust empirical relationship.

Analyzing panel data of 23 OECD countries over the time period of 1971–2004, we find that income inequality is clearly statistically correlated with redistribution. Not only did we look at different spending categories but also at the share gains of different income deciles. It clearly emerges that not

only general inequality as measured by the Gini coefficient, but the difference in (factor) income between the middle classes and the top income decile determine the level of redistribution. This seems to constitute the politically relevant disparity in the income distribution. Our conclusions hold even after using different alternative estimators and running a great number of robustness tests.

These results, however, are not as straightforward as the standard Meltzer-Richards model would predict. Rather, we find that redistribution is not only mainly driven by the P90/50 income ratio, but that it is also targeted at the middle classes. Increasing inequality, espcially between midle class and top income earners. Resources are distributed away not only from the high income earners but also from those at the bottom. The empirical tests reveal that the groups at the receiving end of this redistribution range from the 20^{th} percentile up to the 80^{th} percentile. So there is a rather broad "middle" that benefits from governmental redistribution. These results thus lend support to models based on Director's law.

Although we conducted a lot of testing, even more empirical robustness checks could be imagined. An expansion of the sample to democratic countries from Asia, Latin America and Eastern Europe would be especially desirable. However, the availability of more frequent, high quality income data taken over longer time periods would be even more desirable. The relatively small number of useable observations is a severe limitation in this area of study.

Regardless of the details of our results or possible extensions that could be envisioned, the main finding of our empirical analysis is unambiguous in our view: rising inequality between the middle and top leads to a higher redistribution towards the middle classes. This happens at the expense of those at the lower and higher end of the income distribution.

Appendix

Table 1: Description of Variables

Variable	Source	Description
	Dependent Variables	
Gov. Exp.	OECD Economic Outlook	Total government disbursements, % GDP
Social Exp.	OECD Economic Outlook	Total public social expenditure, % GDP
Soctrans Ratio	LIS Database	Average ratio of social transfers to disposable income
Unemp. Exp.	Armingeon et al. 2006	Cash expenditure compensating for unemployment, % GDP
Health Exp.	OECD Economic Outlook	Public health spending, % GDP,
SG Bottom-10	LIS Database	Share gain of the poorest decile: Disposable income (DPI) - factor income (FI)
SG Bottom-20	LIS Database	Share gain of the two poorest deciles: DPI - FI
SG Middle-80/20	LIS Database	Share gain of 8^{th} - 2^{nd} decile: DPI - FI
SG Top-20	LIS Database	Share gain of the two richest deciles: DPI - FI
SG Top-10	LIS Database	Share gain of the richest decile: DPI - FI
	Variables Measuring Income Inequality	
Gini	LIS Database	Gini coefficient, calculated using factor income
P90/50	LIS Database	Ratio of 90^{th} to 50^{th} factor income percentile
P50/10	LIS Database	Ratio of 50^{th} to 10^{th} factor income percentile
Median Mean Ratio	LIS Database	Median to mean ratio, calculated using factor income
	Economic Variables	
GDP Growth	OECD Economic Outlook	Real GDP growth rate, %
Unemployment Rate	OECD Economic Outlook	Standardized unemployment rate, %
Pop>65	World Development Ind.	Persons aged 65 and above, % total population
	Political Variables	
Voter Turnout	Armingeon et al. 2006	Voter turnout in recent general election, %
Left Government	Armingeon et al. 2006	Cabinet share of social-democratic and other left parties in percentage of total cabinet posts
Disproportionality	Armingeon et al. 2006	Gallagher Index of disproportionality of the electoral system: $disprop = \sqrt{\frac{1}{2}\sum_{i=1}^{m}(v_i - s_i)^2}$, $0 \leq \text{disprop} \leq 100$ with the number of parties $i = 1, ..., m$ v_i – percent of votes obtained by party i, s_i – percent of seats obtained by party i
Federalism	Armingeon et al. 2006	Degree of federalism: 0 = no, 1 = weak, 2 = strong
Plurality	Worldbank, DPI Database	Electoral system: 0 = proportional, 1 = majortitarian

Table 2: Summary Statistics

Variable	Obs.	Mean	Std. dev.	Min.	Max.
Gov. Exp.	195	43.58004	9.19414	18.7274	68.7193
Social Exp.	104	44.02348	7.404349	16.88396	55.94384
Soctrans Ratio	126	0.1812987	0.0786382	0.0021347	0.3681
Health Exp.	155	5.255845	1.325826	0.9033233	8.327445
Unemp. Exp.	118	1.425763	1.101155	0.1	4.84
Gini	118	0.4415281	0.0545838	0.28085	0.58434
P90/50	118	2.282015	0.3629186	1.852257	3.916719
P50/10	118	60.05547	34.3246	1.797563	101.4063
SG Bottom-10	118	3.054301	0.9286713	0.4900002	5.074
SG Bottom-20	118	3.857437	1.172061	0.5200005	6.217
SG Middle-80/20	118	0.661373	7.805863	-80.49999	7.889998
SG Top-20	118	-4.51881	7.841842	-11.1708	76.40599
SG Top-10	118	-1.789471	7.532094	-6.673801	77.786
Median Mean Ratio	114	0.8813064	0.0748706	0.630316	1.010866
GDP Growth	208	2.804977	2.198278	-7.28	9.684
Unemployment Rate	208	6.188983	3.631709	0.17709	18.90696
Pop>65	209	0.1306261	0.0256452	0.0389657	0.1901632
Voter Turnout	232	75.8466	13.82312	40.76	96.79
Left Government	185	36.30197	33.10822	0	100
Disproportionality	212	5.884423	4.740701	0.5185118	21.84986
Federalism	116	0.5965517	0.8554613	0	2
Plurality	218	0.5357798	0.4969071	0	1

Table 3: Correlation Matrix, Part 1

	Gov. Exp.	Social Exp.	Soctrans Ratio	Unemp. Exp.	Health Exp.	Gini	P90/50	P50/10	SG Bottom-10	SG Bottom-20	SG Middle-80/20	SG Top-20	SG Top-10
Gov. Exp	1												
Soc. Exp.	0.1716	1											
Soctrans Ratio	0.7346	0.7162	1										
Health Exp.	0.5372	0.6353	0.5684	1									
Unemp Exp.	0.5721	0.2045	0.4371	0.1513	1								
Gini	0.2399	0.0115	0.4564	0.1451	0.1483	1							
P90/50	-0.051	-0.3287	-0.0251	-0.1427	-0.1231	0.8062	1						
P50/10	0.415	0.4519	0.6125	0.3767	0.5798	0.475	0.1145	1					
SG Bottom-10	0.5114	0.5412	0.5791	0.3819	0.4545	-0.0951	-0.4959	0.4591	1				
SG Bottom-20	0.6114	0.5872	0.6697	0.437	0.4908	0.0166	-0.4333	0.5527	0.9872	1			
SG Middle-80/20	0.1152	0.227	0.207	0.3439	0.0938	0.3195	0.2408	0.1983	-0.1175	-0.0443	1		
SG Top-20	-0.1763	-0.5268	-0.306	-0.546	-0.3189	-0.3205	-0.1749	-0.28	-0.0306	-0.1054	-0.9888	1	
SG Top-10	-0.0943	-0.3544	-0.1934	-0.4578	-0.0721	-0.2552	-0.1673	-0.1896	0.0567	-0.0066	-0.9943	0.9908	1
Median Mean Ratio	0.3026	0.3808	0.3138	0.2417	0.3917	-0.5866	-0.9249	0.1445	0.6842	0.6591	-0.1503	0.0514	0.0859
GDP Growth	-0.4181	-0.1327	-0.1334	-0.2948	-0.0993	-0.1968	-0.1772	-0.0542	0.1192	0.0795	-0.1778	0.129	0.0878
Unemployment	0.2725	0.0363	0.2147	0.1649	0.4863	0.5609	0.4782	0.4409	-0.2368	-0.1556	0.183	-0.1661	-0.1334
Pop>65	0.4477	0.7543	0.6817	0.4988	0.0801	0.0141	-0.3121	0.2698	0.4455	0.4979	0.1284	-0.3729	-0.1741
Voter Turnout	0.3275	0.1952	0.3381	0.2436	0.2689	-0.2088	-0.3809	0.4108	0.6073	0.6093	-0.0557	-0.0262	0.0171
Left Government	0.2278	0.1935	0.1478	0.099	0.1104	-0.1661	-0.2247	-0.0162	0.2476	0.2374	-0.1879	0.1636	0.1737
Disproportionality	-0.2407	-0.1704	-0.1119	-0.0064	-0.1954	0.1792	0.3125	-0.0506	-0.38	-0.3812	0.0078	0.0364	0.0216
Federalism	-0.3886	-0.1186	-0.4831	0.0519	-0.3084	-0.1843	-0.0041	-0.3981	-0.5049	-0.5319	0.0599	-0.0116	-0.0711
Plurality	-0.4826	-0.2163	-0.4331	-0.0326	-0.3972	-0.0239	0.1739	-0.2789	-0.5316	-0.5399	-0.1075	0.3715	0.1942

Table 4: Correlation Matrix, Part 2

	Median Mean Ratio	GDP Growth	Unemployment	Pop. > 65	Voter Turnout	Left Government	Disproportionality	Federalism	Plurality
Median Mean Ratio	1								
GDP Growth	0.1551	1							
Unemployment	-0.3664	0.1441	1						
Pop. > 65	0.4143	-0.1119	0.0363	1					
Voter Turnout	0.5128	-0.106	-0.1199	0.1302	1				
Left Government	0.2119	-0.0728	-0.0706	0.2456	0.2382	1			
Disproportionality	-0.3587	0.066	0.2416	-0.1611	-0.218	-0.1495	1		
Federalism	-0.2426	-0.0203	-0.1276	-0.088	-0.4057	-0.2283	-0.0227	1	
Plurality	-0.3538	-0.0882	-0.0077	-0.1937	-0.3239	-0.1039	0.5929	0.4865	1

Table 5: FE Estimation – Government Expenditure, Social Expenditure, Transfers

	(1) Gov. Exp. %GDP	(2) Gov. Exp. %GDP	(3) Soc. Exp. %GDP	(4) Soc. Exp. %GDP	(5) Soc. Exp. %Budget	(6) Soc. Exp. %Budget	(7) Soctrans Ratio	(8) Soctrans Ratio
Gini (t-1)	-21.45		1.795		134.9**		0.349**	
	(15.21)		(13.63)		(52.74)		(0.173)	
P90/50 (t-1)		-3.075		-0.208		2.286		0.0425
		(3.132)		(2.372)		(11.83)		(0.0331)
P50/10 (t-1)		-0.0231		-0.0359**		-0.144**		0.000235
		(0.0159)		(0.0173)		(0.0680)		(0.000171)
GDP Growth (t)	-0.420*	-0.340	0.240	0.425	1.434	2.604*	0.000704	0.000753
	(0.252)	(0.283)	(0.425)	(0.397)	(0.993)	(1.398)	(0.00356)	(0.00355)
Unemployment (t)	0.989***	1.044***	0.533***	0.566***	-1.306*	-0.325	0.00707***	0.00682***
	(0.215)	(0.240)	(0.150)	(0.139)	(0.743)	(0.710)	(0.00192)	(0.00181)
Pop>65 (t)	95.38	91.44	-5.258	13.00	214.1	165.1	0.990	1.219*
	(59.43)	(65.71)	(52.62)	(50.17)	(226.1)	(184.4)	(0.606)	(0.683)
Voter Turnout (t)	0.311**	0.289**	-0.209	-0.255*	-1.242**	-1.122*	0.00221*	0.00269**
	(0.137)	(0.138)	(0.149)	(0.147)	(0.559)	(0.606)	(0.00119)	(0.00122)
Left Government (t)	0.00379	0.00155	-0.0262**	-0.0332***	-0.0932**	-0.128***	-3.67e-05	-2.89e-05
	(0.0114)	(0.0119)	(0.0111)	(0.0110)	(0.0416)	(0.0382)	(0.000120)	(0.000129)
Disproportionality (t)	0.233	0.230	0.0284	-0.00188	-1.063	-0.582	0.00311	0.00326
	(0.233)	(0.249)	(0.168)	(0.167)	(0.696)	(0.658)	(0.00310)	(0.00335)
Observations	93	93	70	70	70	70	76	76
No. of Countries	22	22	19	19	19	19	19	19
R^2	0.481	0.485	0.728	0.745	0.576	0.661	0.572	0.559
WT AR(1) (p-value)	6.86e-06	1.17e-07	0.00307	0.00508	0.00210	0.00191	0.0346	0.0221
Wald test TD (p-value)	0.160	0.111	4.32e-08	1.75e-09	0.165	0.00270	0.639	0.413

Fixed effects estimation coefficients with Huber-White robust or heteroskedasticity and autocorrelation consistent standard errors in parentheses (depending on the Wooldridge test). *** significant at 1%; ** significant at 5%; * significant at 10%

Table 6: FE Estimation – Unemployment Expenditure and Health Expenditure

	(1) Unemp. Exp. % GDP	(2) Unemp. Exp. % GDP	(3) Unemp. Exp. % Budget	(4) Unemp Exp. % Budget	(5) Health Exp. % GDP	(6) Health Exp. % GDP	(7) Health Exp. % Budget	(8) Health Exp. % Budget
Gini (t-1)	-1.414		-4.830*		-1.360		1.099	
	(1.813)		(2.655)		(2.849)		(4.672)	
P90/50 (t-1)		-0.171		-0.800		-0.372		-0.563
		(0.368)		(0.569)		(0.542)		(0.964)
P50/10 (t-1)		-0.00350		-0.00533		-0.00588		-0.0121
		(0.00233)		(0.00394)		(0.00429)		(0.00809)
GDP Growth (t)	-0.000225	0.0107	0.0425	0.0529	-0.132*	-0.111	-0.211	-0.152
	(0.0416)	(0.0431)	(0.0728)	(0.0745)	(0.0800)	(0.0793)	(0.176)	(0.170)
Unemployment (t)	0.244***	0.251***	0.411***	0.424***	-0.0370	-0.0222	-0.309***	-0.268***
	(0.0215)	(0.0232)	(0.0344)	(0.0368)	(0.0497)	(0.0478)	(0.100)	(0.100)
Pop>65 (t)	-3.461	-3.636	-3.266	-3.486	-22.33	-23.18	-54.48*	-55.40*
	(6.846)	(6.439)	(11.42)	(10.99)	(16.92)	(15.49)	(32.71)	(30.87)
Voter Turnout (t)	0.00217	-0.00507	-0.00389	-0.0138	0.0254	0.0195	-0.0259	-0.0377
	(0.0128)	(0.0140)	(0.0239)	(0.0272)	(0.0203)	(0.0195)	(0.0471)	(0.0466)
Left Government (t)	0.00178	0.00132	0.00326	0.00269	-0.00202	-0.00286	-0.00801	-0.0100*
	(0.00143)	(0.00162)	(0.00244)	(0.00266)	(0.00256)	(0.00271)	(0.00523)	(0.00550)
Disproportionality (t)	-0.0171	-0.0236	-0.0309	-0.0469	-0.0306	-0.0350	-0.167**	-0.176**
	(0.0223)	(0.0237)	(0.0424)	(0.0445)	(0.0324)	(0.0344)	(0.0692)	(0.0715)
Observations	72	72	71	71	90	90	89	89
No. of Countries	16	16	16	16	22	22	22	22
R^2	0.730	0.738	0.696	0.702	0.439	0.453	0.601	0.611
WT AR(1) (p-value)	0.00262	0.00574	0.00454	0.00696	1.20e-07	1.45e-07	5.64e-07	2.29e-07
Wald test TD (p-value)	0.297	0.359	0.369	0.479	0.0146	0.0174	0.0132	0.0105

Fixed effects estimation coefficients with Huber-White robust or heteroskedasticity and autocorrelation consistent standard errors in parentheses (depending on the Wooldridge test). *** significant at 1%; ** significant at 5%; * significant at 10%

Table 7: FE Estimation – Share Gains (SG)

	(1) SG Bottom-10	(2) SG Bottom-10	(3) SG Bottom-20	(4) SG Bottom-20	(5) SG Middle-80/20	(6) SG Middle80/20	(7) SG Top-20	8) SG Top-20	(9) SG Top-10	(10) SG Top-10
Gini (t-1)	-3.655***		-6.842***		16.70***		-12.34***		-12.04***	
	(1.407)		(2.029)		(5.298)		(3.982)		(3.173)	
P90/50 (t-1)		-0.406		-0.527*		2.095*		-1.568*		-1.767**
		(0.252)		(0.277)		(1.115)		(0.946)		(0.758)
P50/10 (t-1)		-0.00247		-0.00275		0.00492		-0.00217		-0.00381
		(0.00191)		(0.00208)		(0.00716)		(0.00604)		(0.00570)
GDP Growth (t)	0.0324	0.0323	0.0120	0.0294	-0.445***	-0.409***	0.416***	0.379***	0.318***	0.307***
	(0.0392)	(0.0438)	(0.0557)	(0.0458)	(0.121)	(0.144)	(0.101)	(0.117)	(0.0823)	(0.0927)
Unemployment (t)	-0.0105	-0.00910	0.0253	0.00857	0.167*	0.176**	-0.174***	-0.184***	-0.0696	-0.0698
	(0.0257)	(0.0263)	(0.0235)	(0.0261)	(0.0834)	(0.0823)	(0.0595)	(0.0642)	(0.0521)	(0.0550)
Pop>65 (t)	-5.542	-8.063	-4.742	-2.339	27.14	40.75**	-27.47**	-38.41***	-2.086	-8.834
	(7.184)	(7.276)	(9.617)	(8.194)	(19.33)	(18.84)	(12.82)	(13.59)	(11.48)	(11.87)
Voter Turnout (t)	-0.0186	-0.0236	0.00206	-0.0243	-0.0103	7.04e-06	0.0293	0.0243	0.0205	0.0142
	(0.0200)	(0.0207)	(0.0218)	(0.0227)	(0.0491)	(0.0460)	(0.0322)	(0.0321)	(0.0353)	(0.0365)
Left Government (t)	0.000417	0.000282	-0.000234	5.43e-05	0.000173	-0.000670	-0.000354	0.000615	-0.00355	-0.00309
	(0.00139)	(0.00149)	(0.00118)	(0.00164)	(0.00473)	(0.00520)	(0.00376)	(0.00457)	(0.00298)	(0.00380)
Disproportionality (t)	0.0227	0.0214	0.0271	0.0107	0.00563	0.0114	-0.0185	-0.0221	-0.0549	-0.0635
	(0.0286)	(0.0288)	(0.0297)	(0.0300)	(0.0741)	(0.0763)	(0.0529)	(0.0547)	(0.0486)	(0.0499)
Observations	73	73	73	73	77	73	73	73	77	77
No. of Countries	18	18	18	18	22	18	18	18	22	22
R^2	0.237	0.212	0.294	0.139	0.654	0.605	0.706	0.669	0.598	0.550
WT AR(1) (p-value)	0.278	0.195	0.0199	0.113	0.116	0.0415	0.0559	0.0246	0.212	0.105
Wald test TD (p-value)	0.196	0.358	0.0295	0.140	0.202	0.179	0.225	0.151	0.194	0.211

Fixed effects estimation coefficients with Huber-White robust or heteroskedasticity and autocorrelation consistent standard errors in parentheses (depending on the Wooldridge test). *** significant at 1%; ** significant at 5%; * significant at 10%

Table 8: No Lags, Median-to-Mean-Ratio

	(1) Soc.Exp % GDP	(2) Soctrans Ratio	(3) SG Bottom-10	(4) SG Bottom-20	(5) SG Middle-80/20	(6) SG Top-20	(7) SG Top 10
No Lags							
Gini (t)	1.795	0.349**	-3.655**	-4.352**	16.70***	-12.34***	-12.04***
	(13.63)	(0.173)	(1.585)	(1.696)	(5.298)	(3.982)	(3.173)
P90/50 (t)	-0.208	0.0425	-0.406	-0.527	2.095*	-1.568*	-1.767**
	(2.372)	(0.0331)	(0.299)	(0.320)	(1.247)	(0.946)	(0.758)
P50/10 (t)	-0.0359**	0.000235	-0.00247	-0.00275	0.00492	-0.00217	-0.00381
	(0.0173)	(0.000171)	(0.00246)	(0.00270)	(0.00929)	(0.00604)	(0.00570)
Fixed Effects							
Median/Mean (t-1)	-9.282	-0.165	1.122	1.432	-6.064	-4.285	-0.787
	(12.92)	(0.144)	(1.352)	(1.466)	(4.593)	(4.054)	(4.197)

Fixed effects estimation coefficients with White-Huber robust or heteroskedasticity and autocorrelation consistent standard errors in parentheses (depending on the Wooldridge test). Time dummies are included, if indicated by a Wald test.
*** significant at 1%; ** significant at 5%; * significant at 10%.

Table 9: Alternative Estimators for the Expenditure and Share Gain Specifications

	(1) Soc.Exp %GDP	(2) Soctrans Ratio	(3) SG Bottom-10	(4) SG Bottom-20	(5) SG Middle-80/20	(6) SG Top-20	(7) SG Top-10
Driscoll-Kray SE							
Gini (t-1)	1.795	0.349**	-5.526***	-6.842***	13.57***	-6.731*	-8.716***
	(9.405)	(0.133)	(1.598)	(1.696)	(4.375)	(3.239)	(2.141)
P90/50 (t-1)	-0.208	0.0425*	-0.502**	-0.711**	0.639*	0.0721	-0.747***
	(0.294)	(0.0218)	(0.236)	(0.252)	(0.339)	(0.234)	(0.237)
P50/10 (t-1)	-0.0359***	0.000235**	-0.00410**	-0.00458**	0.00531	-0.000731	-0.00361
	(0.00865)	(0.000106)	(0.00161)	(0.00185)	(0.00451)	(0.00276)	(0.00298)
Newey West SE							
Gini (t-1)	1.795	0.542***	-5.526***	-6.842***	13.57***	-6.731	-8.716***
	(16.14)	(0.149)	(1.814)	(2.051)	(5.093)	(4.221)	(3.217)
P90/50 (t-1)	-0.208	0.0362	-0.502**	-0.711**	0.639	0.0721	-0.747
	(2.550)	(0.0293)	(0.256)	(0.304)	(1.006)	(0.923)	(0.734)
P50/10 (t-1)	-0.0359**	0.000508*	-0.00410**	-0.00458***	0.00531	-0.000731	-0.00361
	(0.0156)	(0.000291)	(0.00163)	(0.00175)	(0.00680)	(0.00598)	(0.00438)
Prais-Winsten							
Gini (t-1)	0.929	0.345*	-4.000**	-4.621***	19.12***	-14.44***	-13.65***
	(15.42)	(0.188)	(1.509)	(1.635)	(4.943)	(4.007)	(3.009)
P90/50 (t-1)	-0.107	0.0419	-0.420	-0.528	2.242*	-1.784*	-1.957**
	(2.620)	(0.0351)	(0.296)	(0.320)	(1.235)	(1.016)	(0.743)
P50/10 (t-1)	-0.0389*	0.000234	-0.00241	-0.00274	0.00442	-0.00155	-0.00309
	(0.0218)	(0.000194)	(0.00250)	(0.00270)	(0.00935)	(0.00738)	(0.00581)
FE, Dropping Unemployment							
Gini (t-1)	6.599	0.483**	-3.813**	-4.252**	19.22***	-14.97***	-13.09***
	(14.57)	(0.201)	(1.608)	(1.707)	(5.058)	(4.111)	(3.271)
P90/50 (t-1)	0.249	0.0621*	-0.428	-0.507	2.513**	-2.006**	-1.932**
	(2.626)	(0.0357)	(0.308)	(0.322)	(1.159)	(0.981)	(0.784)
P50/10 (t-1)	-0.0309*	0.000395**	-0.00264	-0.00259	0.00818	-0.00559	-0.00510
	(0.0180)	(0.000182)	(0.00241)	(0.00257)	(0.00715)	(0.00619)	(0.00593)
FE excluding USA							
Gini (t-1)	2.701	0.457**	-3.789**	-4.545***	18.58***	-14.03***	-13.21***
	(13.68)	(0.182)	(1.711)	(1.685)	(5.178)	(4.113)	(3.084)
P90/50 (t-1)	0.0413	0.0425	-0.487	-0.635*	2.573*	-1.938*	-2.041**
	(2.483)	(0.0331)	(0.351)	(0.331)	(1.284)	(1.048)	(0.780)
P50/10 (t-1)	-0.0384*	0.000235	-0.00328	-0.00359	0.0103	-0.00675	-0.00671
	(0.0197)	(0.000171)	(0.00281)	(0.00240)	(0.00958)	(0.00744)	(0.00591)

Results for economic and political control variables are not shown, set up is the same as before. Coefficients for Driscoll-Kraay and Newey-West are fixed effects estimations. *** significant at 1%; ** significant at 5%; * significant at 10%

Table 10: System GMM Estimation – Soctrans Ratio and Share Gains (SG)

	(1) Soctrans Ratio	(2) Soctrans Ratio	(3) SG Bottom 10	(4) SG Bottom 10	(5) SG Bottom 20	(6) SG Bottom 20	(7) SG Middle 80/20	(8) SG Middle 80/20	(9) SG Top 20	(10) SG Top 20	(11) SG Top 10	(12) SG Top 10
Gini (t-1)	0.669**		-6.813*		-5.759		35.27***		-32.14**		-26.17**	
	(0.333)		(3.731)		(4.243)		(12.51)		(12.73)		(10.88)	
P90/50 (t-1)		0.0646		-1.346*		-1.339		6.340***		-4.632**		-3.938**
		(0.0808)		(0.808)		(1.107)		(2.020)		(1.929)		(1.563)
P50/10 (t-1)		0.000769**		0.000657		0.00235		-0.00492		0.00121		0.000782
		(0.000330)		(0.00552)		(0.00748)		(0.0115)		(0.0118)		(0.00766)
GDP Growth (t)	-0.00279	-0.00884*	0.0993**	0.0939	0.0742	0.0878	-0.521***	-0.452***	0.391**	0.367*	0.384**	0.314**
	(0.00483)	(0.00457)	(0.0459)	(0.0708)	(0.0496)	(0.0859)	(0.201)	(0.172)	(0.197)	(0.198)	(0.192)	(0.155)
Unemp (t)	0.00455	-0.000750	0.0205	0.0298	0.0263	0.0637	0.110	-0.0731	-0.0777	0.0724	-0.0163	0.0945
	(0.00341)	(0.00301)	(0.0300)	(0.0517)	(0.0313)	(0.0464)	(0.165)	(0.193)	(0.183)	(0.231)	(0.185)	(0.153)
Pop>65 (t)	1.560*	0.936	11.84**	9.697	15.05**	15.29**	-1.439	9.247	-14.36	-15.86	8.055	0.307
	(0.905)	(0.723)	(5.550)	(5.992)	(6.267)	(6.726)	(11.85)	(17.42)	(13.93)	(21.72)	(11.47)	(14.24)
Vot. Turn. (t)	0.00148	0.000534	0.0195***	0.0158***	0.0260***	0.0202***	-0.00134	0.0333	-0.0325**	-0.0553*	-0.00470	-0.0227
	(0.000920)	(0.00110)	(0.00639)	(0.00403)	(0.00814)	(0.00579)	(0.0162)	(0.0258)	(0.0157)	(0.0287)	(0.0136)	(0.0205)
Left Gov. (t)	-1.47e-05	0.000110	-0.000110	0.000478	0.000121	-0.000431	-0.00384	-0.00624	0.00435	0.00544	-0.00304	-0.000502
	(0.000115)	(0.000166)	(0.00135)	(0.00141)	(0.00165)	(0.00217)	(0.00471)	(0.00431)	(0.00498)	(0.00659)	(0.00320)	(0.00328)
Disproport. (t)	-0.00189*	-0.000615	-0.0343	-0.0302	-0.0352	-0.0433	-0.00889	0.0327	0.0217	-0.0516	-0.00409	-0.0362
	(0.00109)	(0.00156)	(0.0250)	(0.0426)	(0.0272)	(0.0376)	(0.0736)	(0.0645)	(0.0893)	(0.0818)	(0.0790)	(0.0517)
Obs.	80	80	77	77	77	77	77	77	77	77	77	77
No. of N	23	23	22	22	22	22	22	22	22	22	22	22
No. of instr.	21	18	15	18	15	18	15	18	15	18	15	18
AR(1)	0.218	0.409	0.0246	0.0285	0.0274	0.0262	0.0866	0.161	0.0990	0.154	0.0798	0.0917
AR(2)	0.208	0.223	0.459	0.383	0.281	0.409	0.815	0.611	0.887	0.750	0.911	0.780
Hansen	0.429	0.535	0.650	0.420	0.625	0.340	0.673	0.815	0.709	0.617	0.453	0.703

All System GMM specifications contain a time trend which is not shown. In all regressions, the real GDP growth rate, the unemployment rate and the Gini coefficients (the percentile ratios) are assumed to be endogenous and included as up to 1-period lagged variables in the GMM specification. All other independent variables are assumed to be exogenous. *** significant at 1%; ** significant at 5%; * significant at 10%

Table 11: FE Estimation – Alternative Institutional Variables

	(1) Soctrans Ratio	(2) Soctrans Ratio	(3) SG Bottom 10	(4) SG Bottom 10	(5) SG Bottom 20	(6) SG Bottom 20	(7) SG Middle 80/20	(8) SG Middle 80/20	(9) SG Top 20	(10) SG Top 20	(11) SG Top 10	(12) SG Top 10
Gini (t-1)	0.336		-5.441***		-6.391***		20.76***		-15.29***		-14.59***	
	(0.211)		(1.761)		(1.832)		(6.035)		(5.052)		(3.784)	
P90/50 (t-1)		0.0527		-0.696**		-0.851**		2.915*		-2.203*		-2.284**
		(0.0377)		(0.317)		(0.344)		(1.512)		(1.268)		(0.959)
P50/10 (t-1)		-3.33e-05		-0.00398**		-0.00416**		0.00103		0.00160		-0.000667
		(0.000224)		(0.00193)		(0.00208)		(0.00941)		(0.00730)		(0.00598)
GDP Growth (t)	0.00245	0.00482	-0.0484	-0.0671	-0.0527	-0.0760	-0.417**	-0.284	0.420***	0.304*	0.315***	0.234*
	(0.00584)	(0.00560)	(0.0516)	(0.0513)	(0.0563)	(0.0562)	(0.173)	(0.181)	(0.148)	(0.151)	(0.112)	(0.118)
Unemp (t)	0.00781***	0.00866***	0.00449	0.00956	0.0215	0.0262	0.143	0.188*	-0.146*	-0.188**	-0.0511	-0.0773
	(0.00262)	(0.00238)	(0.0178)	(0.0206)	(0.0179)	(0.0214)	(0.103)	(0.103)	(0.0864)	(0.0868)	(0.0666)	(0.0669)
Pop>65 (t)	1.039*	1.297**	10.57	9.631	16.30*	15.30*	16.29	33.11	-29.32**	-43.66***	-3.487	-13.32
	(0.598)	(0.647)	(7.568)	(7.780)	(8.640)	(8.850)	(16.37)	(20.88)	(13.11)	(15.72)	(10.30)	(11.51)
Federalism (t)	-0.00638	-0.00685	-0.551***	-0.577***	-0.676***	-0.703***	0.651**	0.809**	-0.0735	-0.182	-0.539**	-0.611**
	(0.00707)	(0.00782)	(0.131)	(0.133)	(0.127)	(0.135)	(0.317)	(0.361)	(0.266)	(0.308)	(0.208)	(0.237)
Plurality (t)	-0.00707	-0.0118	-3.412***	-3.660***	-3.708***	-3.981***	3.317***	3.367**	-0.119	0.0293	-0.942	-1.046
	(0.0161)	(0.0182)	(0.448)	(0.467)	(0.458)	(0.493)	(1.013)	(1.496)	(0.837)	(1.187)	(0.637)	(0.879)
Obs.	61	61	60	60	60	60	61	61	61	61	61	61
No. of N	15	15	15	15	15	15	16	16	16	16	16	16
R^2	0.556	0.544	0.513	0.504	0.506	0.489	0.680	0.621	0.723	0.682	0.616	0.562
WT AR(1)	0.0106	0.000459	0.151	0.0466	0.0608	0.00884	0.289	0.121	0.294	0.144	0.238	0.166
Wald TD	0.481	0.618	0.00521	0.0182	0.00158	0.0136	0.252	0.173	0.290	0.189	0.155	0.135

Fixed effects estimation coefficients with White-Huber robust or heteroskedasticity and autocorrelation consistent standard errors in parentheses (depending on the Wooldridge test). WT AR(1): Wooldridge test of the null hypothesis of no-first-order autocorrelation; Wald test TD: Wald test for the inclusion of time dummies, if p-value<0.1 time dummies are included (coefficients for time dummies are not shown).
*** significant at 1%; ** significant at 5%; * significant at 10%.

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