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Redistributive Politics, Power Sharing and Fairness*

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Abstract

We study the effect of power sharing over income redistribution among different socio-economic groups in a model of redistributive politics with fairness concern. We prove that a unique pure-strategy equilibrium exists under fairly general conditions; and we show that equilibrium transfers depend on the interplay of four main factors: (i) the gap between the population and the group average pre-tax income; (ii) the *relative* ideological neutrality of the poor, (iii) parties' and voters' concern with income inequality, and (iv) the proportionality of the electoral rule. A number of comparative statics predictions emerge from our characterization. Among them, our analysis shows that the net transfers to the middle class and the rich (resp., the poor) increase (resp., decrease) with power sharing disproportionality. Further, we prove that the Gini coefficient associated with the distribution of disposable incomes also rises with the disproportionality of the power sharing rule, which amount to say that income inequality rises as policymaking power gets more concentrated in the majority winning party. We confront these predictions to the data, using an unbalanced panel of developed and developing democracies. The empirical evidence strongly supports both, the positive effect of the income gap over the group transfers, and the relationship between the Gini index (and respectively, the group transfers) and power sharing disproportionality.

JEL Classification Codes: C72, D72, D78.

Keywords: Income Redistribution; Targeted Spending; Swing Voter; Electoral Rule; Power Sharing; Fairness; Income Inequality.

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1 Introduction

A major role of government in modern democracies consists in redistributing income from the affluent in society to those in need. In this paper, we show that the interaction between political power sharing and society's concern with fairness constitutes a significant determinant of government redistribution and income inequality, due to the fact that power sharing shapes politicians' incentives and the intensity of their competition for votes. And fairness moderates the electoral conflict by limiting how far political parties are willing or capable to go in trading off equity for votes.

To formalize this argument, we consider a probabilistic voting model of redistributive politics based on Lindbeck and Weibull (1987), and we extend it to examine, in the presence of fairness concern, how the distribution of policymaking power shapes the redistribution among different socio-economic groups and income inequality. In addition, we perform an empirical assessment of the model using new data (not yet applied to this setting) on preferences for fairness and on voters' ideological alignment, collected from the European Social Survey (ESS); and data from the Luxembourg Income Study (LIS) and several comparative politics datasets on, respectively, public transfers and income inequality, and on power sharing disproportionality.

Following recent research on fairness and redistribution, pioneered by Alesina and Angeletos (2005a,b),[1] we first modify the probabilistic voting model to allow voters to express a concern not just about their own well-being (e.g., disposable income), but also about the well-being of other members of society. This is consistent with data from laboratory experiments and neuro-imaging studies, which show that people are to some extent willing to pay to obtain equity. That is, they are prepared to sacrifice personal gains and share resources with others to eliminate inequalities that they view as unfair. This evidence has been documented in a large number of studies, including Fehr and Schmidt (1999), Engelmann and Strobel (2004), Dawes et at. (2007) and (2012), Tabibnia et al. (2008), Fehr (2009), Almås et al. (2010), Tricomi et al. (2010), Zaki and Mitchell (2011), and Rilling and Sanfey (2011), among others.

In our model, the concern with fairness embedded into voters' and parties' preferences over redistributive policies is represented by a concern with egalitarianism, i.e., a dislike of unequal outcomes per se.[2] This notion of fairness matches closely the data used in the empirical part, which suggest consistently with Alesina and Giuliano (2010) and others that poorer groups of individuals express a larger distaste for inequality. It is worth noting that, in contrast with the inequality aversion concept of Fehr and Schmidt (1999), which

[1]We discuss in greater detail the literature related to our paper in the next section.

[2]Experimental and neural evidence of egalitarian motives in humans in a setting closer to ours strongly support the role of the anterior insula of the human brain (often associated with negative emotions such as pain and distress) in promoting egalitarian behavior (Dawes et at. 2007 and 2012). See also Tabibnia et al. (2008) (resp., Zaki and Mitchell 2011) for neuro-imaging data from the ultimatum (resp., dictator) game showing that subjects place intrinsic value on equitable allocations.

expresses envy and altruism and is self-centered,[3] our "public-value notion" of fairness, as is referred to by Corneo and Grüner (2002), is more in the vein of Arrow (1963), in the sense that individuals' attitude towards income redistribution reflects some ideal or principle of social justice about how economic resources ought to be distributed in society.

Besides introducing fairness into the utility functions, we also extend the tactical redistribution model of Lindbeck and Weibull (1987) to accommodate a continuum of power sharing rules, ranging from purely proportional representation to winner-take-all. This is motivated by the fact that in modern democracies, politics is not "all or nothing", but most often is about consensus and compromise. Indeed, majority and minority parties usually interact in government through a variety of channels and institutions, and the amount of policymaking power shared by these political actors shapes not only policy, but also their electoral incentives and the intensity of electoral competition.

To capture this feature, we borrow from other papers in the literature, and we represent power sharing into the stochastic ideological framework with the help of a *contest success function*, resembling the modelling strategy of the contest literature. This function is meant to reflect in a reduced-form the institutional and legal details (such as, separation of powers, the electoral system, agenda-setting and veto powers, etc.) that shape the mechanism that transforms the votes of the parties, obtained in the election, into decision-making power or "influence" over the implemented policy.[4] In our case, it specifically determines the post-election power of the political parties as a function of their *relative* electoral strengths, i.e., in relation with their *ratio* of votes. The implemented policy is then defined as a combination or *compromise* of the electoral proposals, each weighted by the party's corresponding share of policymaking power.

The main results of the paper are as follows. Firstly, we prove that, under fairly general conditions, the modified probabilistic voting model with fairness and power sharing has a unique pure-strategy equilibrium. The proof rests on standard existence results for strategic games with a continuum of pure strategies. To guarantee the strict quasi-concavity of the conditional payoff functions, which are continuous in the strategy space, we impose a sufficient condition that bears similarities with Lindbeck and Weibull's (1987). To be more precise, in our model each party's payoff function consists of two terms. The first term captures party members' concern with fairness; and is strictly concave in the party's own strategy, given our specification of preferences for redistribution described before.

[3]By self-centerness we mean that fair-minded people in the inequality aversion sense is influenced by the comparison between their own payoffs and that of a reference group, but not by inequality per se, or by the differences among payoffs of other individuals. Interestingly, experimental evidence seems to indicate that the opposite might happen in simple distribution games, where people seem to consider also differences among others in their utility function (Engelmann and Strobel 2004).

[4]Along the paper, we employ the terms power sharing and electoral rules interchangeably and without making a distinction between them. However, as Herrera et al. (2016) points out, the former should be viewed as a much broader concept, representing not (like electoral rules) simply the mapping from votes shares into seat shares in the legislature, but the relationship between electoral outcomes and the parties' direct influence over the policymaking process.

The second term expresses the interest of professional politicians in policymaking power. This term is a strictly increasing transformation of the party's vote share, which is obtained in turns by adding up a series of terms, each reflecting the interaction between the probability distribution of ideological preferences within each income group, and the group's utility differential associated with parties' redistributive policies.

The condition we establish to ensure equilibrium existence demands that the rate at which the percentage of votes of each party varies as result of changes in the relative welfare (utility differential) of the groups be limited by the *overall concavity* of voters' utility function, imposing ipso facto an upper bound on the rate of change of the second term of the party's conditional payoff function. This restriction is stronger than Lindbeck and Weibull's (1987) condition due to the fairness concern, which relates in a non-trivial way the margin vote share of each income group with the transfers received by the other groups. However, it is satisfied in a number of meaningful cases, among which we find the uniform distribution case of ideological preferences, and the doubly exponential distribution (logit) model studied by Lindbeck and Weibull (1987).

Secondly, to understand the nature of the pure-strategy equilibrium, we employ the first-order conditions of each party's constrained optimization problem to characterize in a tractable version of the model the transfers of the groups. Given the similarities of the problems, both parties are shown to converge to the same redistributive policy. This common policy is divided into two parts. The first part coincides with the optimal policy of a purely altruistic party willing to achieve equality after redistribution, and is given by the difference or *gap* between the population and the group mean initial income. The second part represents the amount of *tactical* redistribution across income groups carried out for electoral purposes, and it depends on the interplay of three main factors: (i) the *relative* ideological neutrality of the poor, (ii) parties' and voters' concern with income inequality, and (iii) the (dis)proportionality of the electoral rule.

A number of comparative statics predictions emerge from our equilibrium characterization. Among them, our analysis shows that the net transfers to all groups rise with the income gap. Likewise, the gap between the ideological neutrality of the poor and the average across all income groups increases the transfers to the poor and reduces income inequality. We also find that fairness concern curbs tactical redistribution and income inequality, transferring resources from the middle class and the rich to the poorer segment of society. Interestingly, an effect in the opposite direction on the group transfers is driven by electoral rule disproportionality. Further, we prove that the Gini index after redistribution also rises with the disproportionality of the electoral rule, which amount to say that income inequality increases as policymaking power gets more concentrated in the majority winning party. The latter as well as the effect of power sharing over the transfers take place if and only if parties are fair-minded, in which case the intensity of electoral competition (determined by power sharing) affects parties' willness to trade off votes for equity, and therefore redistribution and inequality. On the contrary, if parties maximize the expected vote shares, the salience of swing voters in the election process and targeted spending are not affected by the power sharing regime.

Finally, thirdly, we confront the above predictions to the data using an unbalanced panel (depending on data availability) of developed and developing countries.[5] Our paper adds in that regard to both, the empirical literature about the stochastic ideological model of tactical redistribution, and the empirical analysis of income inequality under different electoral rules and power sharing mechanisms. To start, we build a panel of countries and years based on macro and micro information provided by the Luxembourg Income Study, from which we obtain the group income and transfers and the Gini, and a series of socio-economic and political datasets for the other main variables of the model.

To elaborate, we use the European Social Survey to gather information about the degree in which the electorate agree with the statement that the "government should reduce differences in income levels", which approximates our concept of individual fairness concern. This database also informs about voters' 'left-right' ideological alignment, which we employ to estimate the ideological independence within the income groups. On the other hand, to measure power sharing, we rely on the index of electoral rule disproportionality due to Taagepera (1986), which represents a better fit with our theoretical concept. To construct the index, data on the total number of voters and parliamentary seats and the mean electoral district magnitude are obtained from various sources, including the Manifesto Project of Volkens et al. (2015) and Carey and Hix's (2011) dataset.[6]

We then carry out a series of regressions, accounting for country-specific, time-invariant fixed effects when the sample size allows, and conducting ordinary least squares otherwise. The empirical evidence (from regressions with 114 and 171 observations for the transfers and the Gini, respectively) strongly supports a positive association of both (i) the income gaps and the group transfers, and (ii) Taagepera's (1986) electoral rule disproportionality and the transfers to the groups (respectively, the Gini coefficient).[7]

The data also show (albeit in a rather smaller sample of observations) a negative and significant association between parties' distaste for inequality and the Gini. However, they don't offer significant evidence of a relation between the ideological independence of the poor and the group transfers. As we explain in the next section, this is in line with other results in the empirical literature on targeted spending, which find little or no support for the swing voter argument. In our case, the result might be partially explained by the small number of observations. But it is also consistent with the fact that fair-

[5] See Appendix B for details about the observations informing the regressions.

[6] For the sake of conciseness, the reader is referred to Section 5 for further details about the data and the definition of Taagepera's (1986) index.

[7] The Online Appendix also reports results using the Gallegher's (1991) index, which is another well-known measure of political power sharing. The two findings pointed out in the text are robust to this alternative specification of the empirical model.

minded parties engage less on tactical spending. Finally, we do find (again in a relatively small sample size) statistically significant evidence of a relation between voters' inequality concern and the transfers to the income groups, though for the non-poor families this relationship has a sign opposite to that predicted by the theory.

The rest of the paper proceeds as follows. In the next section, we discuss the related literature. We set up the model and notation in Section 3. The theoretical results are derived in Section 4. Section 5 describes the hypotheses to be tested and the data employed in the empirical analysis. It also displays and assesses the evidence found. Section 6 concludes the paper discussing directions for future research. For expositional convenience, all proofs and summary statistics are relegated to Appendix A and B, respectively.

2 Related Literature

Our paper relates to three main areas of research. In the rest of this section, we briefly mention the most important articles in each of these areas and how our research differs from previous work. First and foremost, the paper is linked with the formal analysis of tactical or targeted redistribution. This literature began with the "core voter model" of Cox and McCubbins (1986) and the "swing voter model" of Lindbeck and Weibull (1987). These articles examine how two office-minded (vote-maximizing) political parties allocate within a single district selective benefits and costs across various voter groups, which might respond differently in electoral terms (i.e., at the time of casting their votes and rewarding the parties) to targeted welfare policies. Dixit and Londregan (1995, 1996) generalizes the Cox-McCubbins and Lindbeck-Weibull models and show that, when the parties have no special relationships with any groups, tactical redistribution is determined primarily by the density of the more responsive voters in each group. Otherwise, parties' redistributive policies are driven by the core voter logic of benefiting those groups to which the party can most effectively target.

Cox (2010) reviews several extensions of the original framework of tactical redistribution, and Persson and Tabellini (2000) offers a detailed exposition of various economic settings where the model has proved to be fertile, including the size and scope of public spending, federal and regional intergovernmental transfers, interest groups and lobbying, and social security.[8] The basic model of electoral competition that we adopt in this paper is taken from a special version of Lindbeck and Weibull (1987) proposed by Persson and Tabellini (2000). As we explained in the previous section, our work adds to the existing literature in that we study electoral targeting (i) under a continuum of power sharing rules, combining parsimoniously pre- and post-election politics through a reduced-form

[8]See also Strömberg (2004), Robinson and Verdier (2013), and Song, Storesletten and Zilibotti (2012) and Battaglini (2014) for recent applications to mass-media and policymaking, political clientelism, and dynamic electoral competition and public debt, respectively.

mechanism that translates votes into influence over redistribution policy, and (ii) under the presence of fairness concern, an ingredient missing in the current models and essential to the problem of voting over income redistribution.

Regarding the empirical findings on tactical redistribution, Cox (2010) discusses much of the early evidence. The results emerging from the reviewed studies are mixed with respect to both, how much swing as opposed to core voters are targeted, and the significance of these two to explain patterns of redistribution. One major difficulty encountered in the empirical research consists in measuring voters' ideological neutrality. Most of the papers use past voting data and election outcomes to approximate the proportion of swing voters in different geographical districts. This strategy is problematic because voting behaviour is endogenous by assumption to electoral targeting, and it can therefore lead to severely biased estimates. Larcinese, Snyder and Testa (2013) handles this problem by using instead exit polling data from US elections collected by various major news organizations. They find no evidence that the allocation of federal government spending to the states is affected by strategic manipulation to win electoral support.

Our empirical approach differs from previous work in three main aspects. First, we look at income redistribution among socio-economic groups in a pool of democratic countries, instead of intergovernmental transfers to sub-national regions (counties, states, provinces, etc.) within a single national state, as much of the literature does. Second, to account for differences in political power sharing across countries, we consider the Taagepera's (1986) index of electoral rule disproportionality, which is continuous, provides within-country variation, and explicitly accounts for the average district size. Finally, third, we employ survey data to construct direct measures of voters' and parties' characteristics, namely, ideological preferences for the former, and fairness concern for both. We expect the endogeneity bias alluded before to be less significant using this approach because the correlation of survey data with voting behaviour in recent elections is not expected to be high. It is also worth noting that the use of exit polling data like in Larcinese et al. (2013) is not feasible in our case because of the cross-country analysis required to assess the impact of different power sharing mechanisms on targeted spending.

In the second place, our research is related with the literature on redistribution and individual preferences for equality and fairness.[9] Within the traditional Meltzer and Richard's (1981) median voter framework of redistributive politics, preferences for redistribution that goes beyond those motivated by the agents' own economic benefits (the so called "pocketbook interest") have been studied in several articles, including among others Galasso (2003), Alesina and Angeletos (2005a,b), Tyran and Sausgruber (2006), Dhami and al-Nowaihi (2010a,b), Luttens and Valfort (2012), and Flamand (2012). The results of these papers depend obviously on the particular model of social preferences adopted (e.g., inequality aversion à la Fehr and Schmidt (1999) or a public-value concept of fair-

[9] See Alesina and Giuliano (2010) for a recent review about the origin of these preferences.

ness such as altruistic preferences) and on other specificities of the political-economic settings. However, a pretty robust message is that the presence of fairness preferences not only leads to different predictions concerning the extent of redistribution, but also the link between inequality and redistribution.[10]

In the context of the probabilistic voting model, to our knowledge the only article that incorporates preferences for fairness is Alesina, Cozzi, and Mantovan (2012). This paper analyzes a dynamic non-overlapping generation extension of the Lindbeck-Weibull model with a winner-take-all election at the end of each period. Each generation votes on a proportional tax rate, the tax revenues are redistributed lump sum to all individuals, and the government runs a balanced budget in every period. The end-of-life gross wealth of each voter has a random component representing luck, a second part that results from individual effort and ability, and a bequest from the previous generation. Individuals dislike deviations from a distribution of wealth in which everybody gets only the benefits from effort and innate ability. Alesina et al. (2012) shows how different perceptions of fairness of the market outcomes, due perhaps to different historical experiences, can lead the economy to different steady states of redistribution and economic growth. Our paper complements this interesting work by analyzing in a static framework and without distinguishing between fair and unfair inequality (i.e., effort and ability and luck and connections) the theoretical and the empirical consequences of the distribution of policymaking power over the redistributive policies and income inequality.

Finally, third, our work is related with the literature of electoral competition, redistribution and inequality under different power sharing regimes and electoral rules. Among those articles that model power sharing through a contest success function like us, the closest are Saporiti (2014), Matakos, Troumpounis and Xefteris (2015), and Herrera, Morelli, and Nunnari (2016). The first two papers center on equilibrium existence and policy polarization within the traditional spatial model of political competition. The latter instead deals with voter turnout across several costly voting models. The present work share with these previous articles the modelling technique of representing in a reduced-form all the formal and informal political institutions that shape the distribution of policymaking power among the political parties. It captures like these articles a continuum of power sharing regimes through a single "influence proportionality" parameter, ranging from purely proportional representation to winner-take-all.

There is also a rich body of literature that studies, either in models with a single or multiple electoral districts, redistribution and income inequality under two stylized and extreme electoral systems, namely, firs-past-the-post and proportional representation. A central prediction of this literature is that proportional systems favor spending on goods

[10]In particular, in the Meltzer-Richard model, the income distribution affects the tax-transfer policy chosen by majority voting only through the mean to median income ratio. With social preferences, redistribution policies depend as well on the variance of the distribution (Borck 2007).

that benefit broad social groups, whereas firs-past-the-post favors spending on targetable goods provided to specific subsets of voters (see Persson and Tabellini 1999; Lizzeri and Persico 2001; Milesi-Ferretti et al. 2002; and Funk and Gathmann 2013, among others). To our knowledge, our paper is the first attempt to bring this insight into a framework with continuum of power sharing rules; and to quantify the effect of small changes in these rules over both targeted spending and the Gini coefficient.[11]

With regard to the relatively few papers examining *directly* (as opposite to *indirectly* through public spending and redistribution) the relationship between income inequality and the electoral rules, Iversen and Soskice (2006) reports a statistically significant result (based on 47 country-year observations from LIS) suggesting that proportional representation systems appear to be associated with lower levels of inequality, measured by the percentage point reduction in the Gini from before to after taxes and transfers. In a pooled regression with 90 country-year observations, Verardi (2005) meanwhile detects that an increase by 100% of the mean district magnitude lowers the Gini index by more than 3 points. Finally, reporting on cross-country regression results with 70 observations, Feld and Schnellenbach (2014) points out a weakly significant positive association between presidential regimes and the Gini of disposable incomes, but no evidence of a significant relation between the electoral system dummy variable (plurality vs proportional representation) and the Gini.[12]

Compared with the articles cited above, and besides offering a theoretical explanation as to why income inequality might be positively linked with electoral rule disproportionality, our work contributes on the empirical front by (i) significantly extending the database of observations employed, and carrying out country-fixed effects analysis whenever possible, and (ii) exploring the association between the Gini and disproportionality as defined by Tagaepera (1986), instead of simply looking at two stylized electoral systems, which fail to recognize the rich variety of mixed electoral systems that exist in reality.[13]

3 The Model

3.1 Voters

Consider a population of voters divided into three disjoined groups: the rich (R), the middle class (M), and the poor (P). Abusing the notation, let $i \in N = \{P, M, R\}$ refer

[11]The empirical analysis of Persson and Tabellini (1999) also considers a continuous variable, namely, the inverse of the average district magnitude. But it focuses on the size (expenditures of central government in % of GDP) and the scope (expenditures on transportation, education and order and safety in % of GDP) of government, rather than redistribution across socio-economic groups and inequality.

[12]For the reserve causality, that is, from income distribution to electoral system disproportionality, see Horiuchi (2004) and Ticchi and Vindigni (2010).

[13]For a comparative analysis of mixed electoral systems, see for instance Moser and Scheiner (2004).

to both, a generic group of voters, and an arbitrary member of group i.[14] Suppose there is a continuum of voters within each group, with group i's size denoted by $n_i \in (0, 1)$, $\sum_{i\in N} n_i = 1$, and $\sigma_i = n_i/(1 - n_i)$ indicating the relative size of $i \in N$ in relation to the other groups. Let $e_i > 0$ be the initial income of every voter of group $i \in N$. Assume the income distribution is skewed to the right, with the mean income $e = \sum n_i\, e_i$ greater than the median $\bar{e}$, and $e_R > e > \bar{e} = e_M > e_P$.

The initial allocation of resources across groups might not be seen as *fair* in voters' eyes. To represent their preferences for redistribution, let $\mathbf{z} = (z_i)_{i\in N} \in Z$ be an arbitrary income distribution, with $Z = \{\mathbf{z} \in \mathbb{R}^N_+ \mid \sum_{i\in N} n_i\, z_i = \sum_{i\in N} n_i\, e_i\}$ denoting the set of all such allocations. The utility of a voter in group i over Z is given by

$$u_i(\mathbf{z}) = z_i - \alpha_i \sum_{i\in N} n_i\,(z_i - z)^2, \tag{1}$$

where z_i denotes voter i's income, $z = \sum_{i\in N} n_i\, z_i$ is the mean income in the population under the distribution $\mathbf{z} \in Z$, and $\alpha_i \in \mathbb{R}_+$ represents the extent to which the electorate cares about fairness. Following Alesina and Giuliano (2010) and the data of Section 5.1, we assume that $\alpha_P > \alpha_M > \alpha_R$, reflecting the fact that richer groups are more adverse to income redistribution (see Figure 1).

The preferences displayed in (1) are additively separable in the voter's concern with his own well-being and his concern with the others', expressing a trade-off between self-interest and a pro-social motive.[15] The first term of the right-hand side denotes voter i's *selfish utility* over his income z_i. The second term, on the other hand, i.e., the expression $-\alpha_i \sum_{i\in N}\, n_i\,(z_i - z)^2$, measures voter i's intrinsic concern with *fairness* (inequality). To elaborate, taking the mean income under $\mathbf{z}$ as a reference point, voter i's concern with fairness is represented by the weighted sum of the distances between each group's average income and the reference point, with the weights given by the group sizes.

3.2 Political process

To remedy any social injustice in voters' eyes created by the initial allocation of resources, there is a political process that redistributes income across groups through a tax policy. Let $x_i \in \mathbb{R}$ denote a net transfer (a subsidy if $x_i > 0$, or a tax if $x_i < 0$) imposed upon voters of group $i \in N$. A balanced-budget redistributive policy is a vector $\mathbf{x} = (x_i)_{i\in N} \in \mathbb{R}^N$ such that $\sum_{i\in N} n_i\, x_i = 0$ and $x_i \geq -e_i$ for all $i \in N$. We further restrict the set X of all such policies to guarantee no income sorting, in the sense that the ranking of

[14]Voters are heterogenous within each group because they have different ideological preferences (yet to be defined). However, like in the probabilistic voting model of Lindbeck and Weibull (1987), ideological preferences are represented by a parameter that is continuously distributed over the real line. Thus, the mass of voters of any particular type is always zero.

[15]Several recent studies indicate that the prefrontal cortex of the human brain (that has been associated with emotion regulation) plays an essential role in such conflict resolution (Fehr 2009).

disposable incomes $y_i = e_i + x_i$ after redistribution preserves the ordering of the initial incomes of the groups, that is, $y_R \geq y_M \geq y_P$.

As it happens in the standard Lindbeck-Weibull model without fairness and power sharing, under income sorting the ranking of the groups based on their disposable incomes changes after redistribution in such a way that the rich become the lowest income group, the middle class becomes the richest group, and the poor the new middle class. This ranking is not very appealing, since redistribution in the real world doesn't seem to produce such outcomes. To put it differently, though some social mobility occurs in practice, non-rich voters do not seem to possess the political power in a western democracy to carry out a level of expropriation of the rich that transforms the latter after taxes into the poorest group of society. That's why we assume taxation and redistribution are limited by the "more natural" non-income-sorting condition. Despite this, when this condition is relaxed and sorting is permitted, the main qualitative results are similar.[16]

Two political parties, indexed by $C \in \{A, B\}$, take part of the political process and compete in an election proposing simultaneously and independently a redistributive policy $\mathbf{x}^C \in X$.[17] Like in other electoral targeting models, each voter has an ideological bias or preference toward the parties, which is unrelated to the current policy. This preference is fixed in the short-term, and may depend on prior political experience, attributes of the candidates, etc. From the party's viewpoint, Cox and McCubbins (1986), for example, classifies each voter in one of the following three categories: support (resp., opposition) voters, who have supported (resp., opposed) the party in the past and are likely to do so in the future; and swing voters, who have little or no allegiance to any political party, and as such are highly responsive to the current proposals of the parties.

Before the election, political parties are unsure about the ideological preferences of the electorate. More precisely, they view voter i's ideological bias θ_i as being drawn from a twice continuously differentiable probability distribution function $F_i(\cdot)$ over $\mathbb{R}$, with a density f_i that takes a value at zero (neutral bias) of $f_i(0) = \phi_i > 0$. Following data about ideological neutrality and income groups taken from the European Social Survey and displayed in Figure 2, we assume that $\phi_M > \phi > \phi_P > \phi_R$, where $\phi = \sum n_i \, \phi_i$. These conditions on the densities imply that the middle class is the "swing voter group" in our model, with the highest proportion of ideologically independent voters, followed by the poor, and the rich.[18] In addition, the second inequality, that is, $\phi > \phi_P$, rules out the uncompelling case where all voters have the same after-tax equilibrium income. Finally, to prevent any group to be fully expropriated and be left with a non-positive after-tax income, we also assume that $\phi_P > \phi - 2\phi_\alpha \, e$, where $\phi_\alpha = \sum_{i \in N} n_i \, \phi_i \, \alpha_i$ is an average across groups reflecting fairness concern among swing voters.

[16]Results are available at the Online Appendix from the corresponding author's personal web-site.

[17]Hereafter, it is understood that the index $-C$ denotes B if $C = A$ and A if $C = B$.

[18]Persson and Tabellini (1999) also argue in favor of thinking of the group with the highest density of ideologically neutral voters as consisting of middle class voters.

At the election, each voter votes sincerely for the party that offers higher utility. Specifically, a voter of group i votes for party A if $u_i(\mathbf{y}^A) \geq u_i(\mathbf{y}^B) + \theta_i$, where $\mathbf{y}^C = (y_i^C)_{i\in N}$, with $y_i^C = e_i + x_i^C$ representing group i's after-tax income under the policy of party C. Given that for every group $i \in N$, the initial income e_i is held fixed throughout the analysis, in the sequel we simply denote $u_i(\cdot)$ as a function of $\mathbf{x}^C$. Therefore, the probability that a voter in group i votes for party A given the platforms $\mathbf{x}^A$ and $\mathbf{x}^B$ is $\text{Prob}(\theta_i \leq u_i(\mathbf{x}^A) - u_i(\mathbf{x}^B)) = F_i(u_i(\mathbf{x}^A) - u_i(\mathbf{x}^B))$. As a result, the expected vote share of party A, denoted by v^A, is given by $v^A(\mathbf{x}^A, \mathbf{x}^B) = \sum_{i\in N} n_i\, F_i(u_i(\mathbf{x}^A) - u_i(\mathbf{x}^B))$. If there is no abstention, then party B's vote share is simply $v^B = 1 - v^A$.

So far we have described an application of Lindbeck and Weibull (1987), adapted to multidimensional redistributive problems, with the sole twist that voters are not totally selfish, but they might be concerned with the well-being of other groups of voters. Next, we generalize the policymaking process of Lindbeck and Weibull (1987) assuming that the winning party and the opposition jointly determine the transfer scheme $\mathbf{x} \in X$ in accord with their policy platforms $\mathbf{x}^C$ and their relative political strengths ρ^C, that is,

$$\mathbf{x} = \rho^A\, \mathbf{x}^A + \rho^B\, \mathbf{x}^B, \tag{2}$$

where $\rho^C = \Phi(v^C)$ denotes party C's power share ("influence") at the policymaking process as a nondecreasing function $\Phi : [0,1] \to [0,1]$ of party C's vote share v^C, with the usual requirement that $\rho^B = 1 - \rho^A$.[19]

Regarding the specific functional form of the power sharing function, we follow an string of the literature that sees party influence over policy as being determined by the relative electoral strengths of the parties, represented here by the ratio of votes (Tullock's (1980) rule). Specifically, we assume that the power sharing function ρ^C is given by

$$\rho^C = \frac{1}{1 + \left(\frac{1-v^C}{v^C}\right)^{\eta}}, \tag{3}$$

where $\eta \geq 1$ is a parameter interpreted below as the proportionality of the electoral rule.[20]

Simple algebraic manipulation shows that (3) implies that $\rho^C/\rho^{-C} = (v^C/v^{-C})^{\eta}$, which is Theil's (1969) well-known hypothesis about how vote shares translates into seat shares in a legislature. When $\eta = 1$, the expression above represents the purely proportional representation system, where the influence of each party coincides with its

[19] The influence over policy $\rho^C(\cdot)$ exerted by each party can be interpreted as its probability of determining alone policy $\mathbf{x} \in X$, which is expected to be nondecreasing in the party's vote share.

[20] An alternative to (3) would be to see parties' power shares as a function of the *margin of victory* (or electoral mandate), instead of the *ratio of votes*. The qualitative results of the paper are robust to this alternative specification, since the equilibrium characterization under the "margin of victory" power sharing rule only suffers minor changes in comparison with that derived under (3). Details are omitted for the sake of brevity, but they are available in the Online Appendix.

vote share; that is, $\rho^C = v^C$. As the parameter η rises above 1, the electoral rule gets more disproportionate and biased in favour of the majority winning party.[21] In the limit, as η approaches infinity, (3) captures the winner-take-all system where the party holding more votes controls all branches of government and sets policy unilaterally.

To complete the model, we introduce the parties' payoff functions, $\Pi^C(\cdot)$, which are a combination of the interests of: (i) the politicians and party leaders, who seek power to influence policy, and (ii) other party members and supporters, who care to a certain extent about fairness in society. Formally, the payoff function of party C is defined as $\Pi^C(\mathbf{x}^A, \mathbf{x}^B, \gamma^C) = (1-\gamma^C)\cdot\rho^C - \gamma^C\,\frac{1}{2}\cdot\sum_{i\in N} n_i\,(y_i^C - y^C)^2$, where $y^C = \sum_{i\in N} n_i\, y_i^C$ is the mean after-tax income under the policy of party C, and $\gamma^C \in [0,1]$ reflects party C's concern with fairness. When $\gamma^C = 0$, the expression of Π^C represents the political motivation case where party C maximizes its expected vote shares. At the other extreme, when $\gamma^C = 1$, the party is purely altruistic, and it seeks to achieve after the election an egalitarian distribution of income. In between these limit cases, parties compete motivated (and not necessarily in the same way) by both, policy influence and fairness.

3.3 Timing

Let $\mathcal{G}(\gamma^A, \gamma^B) = (X, \Pi^C(\,\cdot, \gamma^C))_{C=A,B}$ denote the ***redistributive election game*** determined by the model sketch above. The timing of this game is as follows. First, parties A and B propose simultaneously and non-cooperatively redistributive policies $\mathbf{x}^A$ and $\mathbf{x}^B$, respectively. At this stage, parties know the initial income of the groups, voters' preferences over the income distribution, and the group-specific cumulative distributions of the ideological bias, but not yet their realized values. Second, the actual values of θ_i are realized and all uncertainty is resolved. Third, voters cast their vote for one of the parties (no abstention). Fourth, the vote and the power shares are determined and, together with the parties' proposals, they determine the implemented policy, as is indicated by equation (2). Finally, fifth, parties and voters receive their respective payoffs.

4 Equilibrium

In order to derive the main result of this section, we first show that under fairly general conditions, the redistributive election game has a unique equilibrium in pure strategies. To do that, for any group $i \in N$, let the index $\left(\sum_{j\in N}\xi_{ij}(\mathbf{x}^C)\right)^{-1}$ be a measure of the overall concavity of the utility function $u_i(\cdot)$ at $\mathbf{x}^C$, where $\xi_{ij}(\mathbf{x}^C) = -\frac{[\partial u_i(\mathbf{x}^C)/\partial x_j^C]^2}{\partial^2 u_i(\mathbf{x}^C)/\partial x_j^C \partial x_j^C}$. Likewise, given a strategy profile $(\mathbf{x}^A, \mathbf{x}^B) \in X \times X$, denote the utility differential $t_i = u_i(\mathbf{x}^A) - u_i(\mathbf{x}^B)$, and let $r_i(t_i) = \frac{f_i'(t_i)}{f_i(t_i)}$ be the rate at which the rate of change of party

[21] For instance, when $\eta = 3$, the seat allocation follows the "cube law", which is seen as approximating the distortions created in favour of the winner party in first-past-the-post elections.

C's vote share varies within group i in response to changes in i's utility of party C's policy vis-à-vis the opponent's.[22] As is shown in Appendix A, a sufficient condition for a pure-strategy equilibrium to exist in $\mathcal{G}(\gamma^A,\, \gamma^B)$ is that the concavity index be greater than the rate $r_i(t_i)$, imposing ipso facto an upper bound on the rate at which the vote and the power shares could change as result of variations in the policies' utility differential.

Condition $\mathbb{C}$: For all $i \in N$, $C = A,\, B$, and $\mathbf{x}^C \in X$, $r_i(t_i) < \left(\sum_{j\in N} \xi_{ij}(\mathbf{x}^C)\right)^{-1}$.

This condition is fulfilled in a number of meaningful cases, including the uniform distribution and the doubly exponential distribution (logit) case considered by Lindbeck and Weibull (1987), the latter when the overall concavity is greater than one. As a passing remark, notice that in Lindbeck and Weibull (1987) the right-hand side of Condition $\mathbb{C}$ is simply $\left(\xi_{ii}(\mathbf{x}^C)\right)^{-1}$. The reason is the cross-derivatives of the vote share are all null, which simplifies greatly the Hessian matrix of v^C (see Appendix A). By contrast, due to the fairness concern, in our case the marginal increase in the percentage of votes that one party obtains by changing group i's transfers varies with the transfers to group $j \neq i$.

Proposition 1 If condition $\mathbb{C}$ holds, then the redistributive election game $\mathcal{G}(\gamma^A,\, \gamma^B) = (X,\, \Pi^C(\,\cdot,\, \gamma^C))_{C=A,B}$ has a unique pure-strategy Nash equilibrium $(\mathbf{x}^A, \mathbf{x}^B) \in X \times X$.

The proof of Proposition 1 is displayed for expositional convenience in Appendix A, as is the proof of any other result in the paper. Here it is worth pointing out that Proposition 1 guarantees the existence of Nash equilibrium in pure strategies in a broad family of tactical redistribution games $\mathcal{G}(\gamma^A,\, \gamma^B)$, including games with *symmetric* (i.e., $\gamma^A = \gamma^B$) and *asymmetric* (i.e., $\gamma^A \neq \gamma^B$) party fairness concerns. The latter family is particularly interesting because in reality political parties might care differently about fairness, due for example to different views about the driving forces behind income inequality (e.g., luck vs effort); or because one party is "captured by" say the rich and the elite, and the other is heavily influenced by the unions and the working class.

Despite the appeal of and the existence result under asymmetric party fairness, an equilibrium characterization for this case is typically hard to derive without severely restricting the model structure. Further, even when closed-form expressions can be calculated, there is not much one can say about how redistribution responds to changes in the main parameters of the model (i.e., power sharing, fairness, and ideological neutrality), because parties propose different transfers at the equilibrium, and that implies the expected vote shares depend on the specific distribution of the ideological bias.[23] To illustrate, we show in the Online Appendix that in the simplest asymmetric scenario one could possibly imagine, where one party, say A, is not fair-minded and the other, say B, is

[22] In the uniform case, for instance, this ratio is equal to zero, meaning that changes in the utility differential affect the vote share of each political party at a constant rate.

[23] By contrast, we show below that in the symmetric fairness case, regardless of the c.d.f. F_i, the expected vote shares are 1/2 at the equilibrium, because both parties campaign on the same policy.

purely altruistic, the transfers to group $i \in N$, namely, $x_i = e - e_i + \rho^A \cdot \widetilde{\beta}_i \cdot (\phi - \phi_P)$, with $\widetilde{\beta}_R = \widetilde{\beta}_M = \sigma_P \, (2\, \phi_\alpha)^{-1} = -\sigma_P \, \widetilde{\beta}_P$, depends on party A's equilibrium power share ρ^A, which is determined by equation (3), together with $v^A = \sum_{i \in N} n_i F_i \left(u_i \left(y^A \right) - u_i \left(y^B \right) \right)$, and $u_i \left(y^A \right) - u_i \left(y^B \right) = \widetilde{\beta}_i \cdot (\phi - \phi_P) - \alpha_i \cdot (\phi - \phi_P)^2 \cdot \sum_{i \in N} n_i \cdot \widetilde{\beta}_i^2$, where F_i represents the uniform distribution on $[-\frac{1}{2\phi_i}, \frac{1}{2\phi_i}]$. These are clearly complex expressions that do not allow to tell much about the comparative statics of the equilibrium of the game.

To circumvent this difficulty, we focus below on a much more tractable case where the two parties care equally about fairness, that is, $\gamma^A = \gamma^B = \gamma$. The resulting redistributive election game with symmetric fairness concerns, denoted by $\mathcal{G} = \mathcal{G}(\gamma, \gamma)$, is then used to investigate not only the equilibrium shape of the group transfers, but also the effects of targeted spending on inequality after redistribution. As we explained above, our excuse for focusing on symmetric party fairness is mostly pragmatic. However, we reckon that it is also partly justified by the fact that our modelling strategy deliberately abstract from considerations about the socio-economic structure of the political parties, and it does not distinguish either among alternative sources of individual income (e.g., effort, ability, luck, etc.), both of which might create different perceptions within the parties about the fairness of the income distribution. We come back to the asymmetric fairness case at the end of the paper in Section 6, where we briefly discuss how the things we know about its equilibrium outcome compares with the symmetric equilibrium studied next.

We now characterize the equilibrium transfers emerging from the election, under the preferences for redistribution and the power sharing rule shown in (1) and (3), respectively, and assuming that $\gamma^A = \gamma^B = \gamma \in [0, 1]$.

Proposition 2 Let $(\mathbf{x}^A, \mathbf{x}^B) \in X \times X$ denote the pure-strategy equilibrium of the redistributive election game $\mathcal{G}$. For all $i \in N$, $x_i^A = x_i^B$, where

$$x_i^C = \underbrace{(e - e_i)}_{AR} + \underbrace{\beta_i \, (\phi - \phi_P)}_{TR}, \;\; C = A, B, \tag{4}$$

with $\beta_P = -\frac{(1-\gamma)\,\eta}{(1-\gamma)\,2\,\eta\,\phi_\alpha + \gamma} < 0$ and $\beta_M = \beta_R = \frac{(1-\gamma)\,\eta\,\sigma_P}{(1-\gamma)\,2\,\eta\,\phi_\alpha + \gamma} > 0$.

There are several points of interest about this outcome. Firstly, the characterization given in Proposition 2 indicates that regardless of the nature of the electoral system (that is, proportional representation, winner-take-all, or a system in between), the usual centripetal forces of electoral competition lead political parties to converge to the same redistributive policy. Secondly, it shows that the transfer policy (4) to which parties converge at the equilibrium can be decomposed into two parts:

- A first part that we call ***altruistic redistribution*** (or "AR" for short), which coincides with the policy chosen by an altruistic political party, and is equal to the gap between the population and the group mean initial income; and

- A second part that captures the amount of ***tactical redistribution*** (or "TR" for short) carried out for electoral purposes.

Moreover, Proposition 2 shows that TR depends on the interplay of three main factors: (i) the ideological neutrality gap of the poor, measured by the difference between the density of swing voters in that group and the average density in society, (ii) the proportionality of the electoral rule, and (iii) parties' and voters' concern with income inequality. As a passing remark, note that when $\gamma = 0$ the power sharing rule (that determines the intensity of electoral competition) has no effect on the group transfers. On the contrary, if voters are not concerned with fairness (i.e., $\alpha_i = 0$ for all $i \in N$), then the condition on the densities for the existence of an interior solution is not satisfied, and the unique equilibrium of the redistributive election game would be the swing voter equilibrium of Lindbeck and Weibull (1987) under no income sorting.[24]

From the utilitarian viewpoint, the equilibrium displayed in Proposition 2 is socially optimal, in the sense that it can be rationalized as the policy outcome obtained by maximizing a utilitarian social welfare function that weights voters' utility functions according with the group sizes, the ex-ante distribution of ideological preferences, the fairness concern parameters, and electoral rule disproportionality. To be precise,

Corollary 1 If $\mathbf{x}^C \in X$ denotes party C's equilibrium policy at the election game $\mathcal{G}$, then $\mathbf{x}^C = \arg\max_{\mathbf{x}\in X} \sum_{i\in\mathcal{N}} d_i\, u_i(\mathbf{x})$, where $d_i = (1-\gamma)\,\eta\, n_i\, f_i(0) + \gamma\, \frac{n_i}{2\sum_{i\in\mathcal{N}} n_i \alpha_i}$.

Thirdly, our assumptions on the income distribution and on the group densities imply that the equilibrium transfers to the middle class are always positive. For the other two groups, the sign of the transfers is undetermined because AR and TR work on opposite directions. By playing with the magnitudes of these two, it could happen that either the middle class and the poor (resp., rich) benefit from income redistribution at the expense of the rich (resp., poor); or that the middle class is the only group benefiting from redistributive politics, a result known in the literature as Director's law.[25] This latter case would take place if, for instance, ideological preferences among the poor are sufficiently high to offset the group's positive AR-transfers, but not strong enough to compensate the negative AR-transfers to the rich.

Besides revealing that altruistic redistribution only varies (rises) with the income gaps, Proposition 2 offers also some insight as to how tactical redistribution is affected by the other parameters of the model. Corollaries 2-3 below collect these results.[26] To start,

[24] In our model such equilibrium would imply that the initial income of the poor is expropriated and shared by the rich and the middle class.

[25] Director's law refers to the alleged empirical regularity found by Aaron Director according to which in a democracy "public expenditures are made for the primary benefit of the middle classes, and financed with taxes which are borne in considerable part by the poor and the rich" (Stigler 1970).

[26] In what follows, we implicitly assume that $\gamma \neq 1$, since otherwise group transfers consist only of altruistic redistribution and they are consequently invariant to changes in the parameters investigated.

notice that an increase in ϕ_P raises the transfers to the poor, as is indicated by (2.A), because as a group they become more responsive to policy and their votes are easier to swing with TR-transfers. Due to the non-income-sorting restrictions and the balanced-budget condition, both binding at the equilibrium, a greater ϕ_P decreases simultaneously (and in the same magnitude) the TR- and the total transfers received by the non-poor.

Corollary 2 Let $\mathbf{x}^C \in X$ denote party C's equilibrium policy at the redistributive election game $\mathcal{G}$. For all $i \in N$, $\frac{\partial x_M^C}{\partial \phi_i} = \frac{\partial x_R^C}{\partial \phi_i} = -\sigma_P \frac{\partial x_P^C}{\partial \phi_i}$, and

(2.A) $\frac{\partial x_P^C}{\partial \phi_P} = \beta_P \cdot \frac{(n_P-1)\,\gamma+(1-\gamma)\,2\eta\,[(n_P-1)\,\phi_\alpha - n_P\,\alpha_P(\phi-\phi_P)]}{(1-\gamma)\,2\,\eta\,\phi_\alpha+\gamma} > 0,$

(2.B) $\frac{\partial x_i^C}{\partial \phi_i} = \beta_i \cdot \frac{n_i\,\gamma+(1-\gamma)\,2\eta\,n_i\,[\phi_\alpha-\alpha_i(\phi-\phi_P)]}{(1-\gamma)\,2\,\eta\,\phi_\alpha+\gamma}$, with $i = M, R$.

As is shown in (2.B), the effect of a change in ϕ_M (resp., ϕ_R) over x_i^C is undetermined, meaning that in contrast with Lindbeck and Weibull (1987), equilibrium TR-transfers do not necessarily rise in *all* groups with the percentage of swing voters.[27] On the one hand, a greater ϕ_M (resp., ϕ_R) raises the average density of swing voters across groups, reducing the electoral appeal of the poor vis-à-vis the middle class. Given that the non-sorting constraint associated with the income of the middle class and the rich is binding at the equilibrium, this reduces also the appeal of the poor vis-à-vis the rich. Thus, the first effect (through the rise of the ideological neutrality gap of the poor) is positive for x_M^C and x_R^C, and negative for x_P^C. On the other hand, an increase in ϕ_M (resp., ϕ_R) also increases β_P and reduces the coefficients β_M and β_R. This works in the direction opposite to the first effect, capturing how fairness and power sharing interact with the ideological bias. Therefore, the total effect of a change of ϕ_M (resp., ϕ_R) over x_i^C is ambiguous.[28]

The second set of comparative statics results indicates that the effect of (either citizens' or parties') inequality concern over TR-transfers is negative for the middle class and the rich, who benefit from tactical redistribution, and positive for the poor (see (3.A) and (3.B) below). This means that fairness preferences curb to some extent money transfers across income groups motivated by electoral targeting. As was pointed out before and is shown in (4), AR-transfers are not directly affected by inequality concern.

Corollary 3 Let $\mathbf{x}^C \in X$ denote party C's equilibrium policy at the redistributive election game $\mathcal{G}$. For all $i \in N$, and all $t = \alpha_i, \gamma, \eta$, sign $\left(\frac{\partial x_i^C}{\partial t}\right) = $ sign $\left(\frac{\partial \beta_i}{\partial t}\right)$, and

(3.A) $\frac{\partial \beta_R}{\partial \alpha_i} = \frac{\partial \beta_M}{\partial \alpha_i} = -\sigma_P \frac{\partial \beta_P}{\partial \alpha_i} = -\frac{2\,(1-\gamma)^2\,\eta^2\,\sigma_P\,n_i\,\phi_i}{[(1-\gamma)\,2\,\eta\,\phi_\alpha+\gamma]^2} < 0,$

(3.B) $\frac{\partial \beta_R}{\partial \gamma} = \frac{\partial \beta_M}{\partial \gamma} = -\sigma_P \frac{\partial \beta_P}{\partial \gamma} = -\frac{\eta\,\sigma_P}{[(1-\gamma)\,2\,\eta\,\phi_\alpha+\gamma]^2} < 0,$

[27]This result is, however, reestablished when income sorting is permitted. For more details, see the Online Appendix at the corresponding author's personal web-site.

[28]The reason why the effect of ϕ_P over x_i^C is not ambiguous is because when ϕ_P rises, the average density increases less than the density of swing voters in the poor group, implying that both effects, through the ideological gap and the beta parameter, are positive for the poor and negative for the rest.

(3.C) $\frac{\partial \beta_R}{\partial \eta} = \frac{\partial \beta_M}{\partial \eta} = -\sigma_P \, \frac{\partial \beta_P}{\partial \eta} = \frac{(1-\gamma)\,\gamma\,\sigma_P}{[(1-\gamma)\,2\,\eta\,\phi_\alpha+\gamma]^2} > 0.$

Finally, the effect of the power sharing parameter on TR-transfers is positive for the high density group, that is, the middle class; and, due to the non-income-sorting (resp., balanced-budget) constraint, it is also positive (resp., negative) for the rich (resp., poor). This captures that a political system that assigns policy influence more disproportionately among political parties rises the importance of winning a majority at the election, and thereby the stake of the parties in the swing voter group. This result is reminiscent of that derived in Persson and Tabellini (1999), according to which majoritarian elections make electoral competition stiffer, and that implies more targeted redistribution towards the politically influential middle class. In particular, (3.C) implies that tactical redistribution toward the middle class and the rich (resp., poor) is at the lowest (resp., highest) level under proportional representation, and increases (resp., decreases) smoothly as the power sharing system gets more disproportionate.

The closed-form expression (4) of the transfer policy allows also to study the effect of the parameters of the model on income inequality after redistribution. To do that, we follow a usual method of estimating the Gini coefficient when data is grouped into classes. This consists in approximating the Lorenz curve by a series of straight lines joining the known points, and then calculating the relevant area as a series of trapezia and triangles. The resulting estimation, denoted $\hat{G}$, can be written as follows (Fuller 1979):

$$\hat{G} = 1 - \sum_{i \in N'} n_i \, (Y_i + Y_j), \quad j = i - 1, \tag{5}$$

where Y_ℓ denotes the percentage of cumulative income up until group ℓ, with $Y_0 = 0$, the set N' is a rearrangement of N in the order of increasing after-tax incomes, and $j = i-1$ refers to the group immediate before group i in terms of its income share.

Corollary 4 The groups' after-tax equilibrium incomes $y_i = e + \beta_i(\phi - \phi_P)$, $i \in N$, determine an estimate of the Gini coefficient equal to $\hat{G} = n_P \, \beta_P \, (\phi_P - \phi) \, e^{-1}$. Thus,

(4.A) $\frac{\partial \hat{G}}{\partial \alpha_i} = n_P \, (\phi_P - \phi) \, e^{-1} \, \frac{\partial \beta_P}{\partial \alpha_i} < 0$, $i \in N$,

(4.B) $\frac{\partial \hat{G}}{\partial \gamma} = n_P \, (\phi_P - \phi) \, e^{-1} \, \frac{\partial \beta_P}{\partial \gamma} < 0$,

(4.C) $\frac{\partial \hat{G}}{\partial \eta} = n_P \, (\phi_P - \phi) \, e^{-1} \, \frac{\partial \beta_P}{\partial \eta} > 0$,

(4.D) $\frac{\partial \hat{G}}{\partial \phi_i} = n_P \, e^{-1} \, \beta_P \, \left[\frac{\partial \phi_P}{\partial \phi_i} - n_i + (\phi - \phi_P) \frac{(1-\gamma)\,2\,\eta\,n_i\,\alpha_i}{(1-\gamma)\,2\,\eta\,\phi_\alpha+\gamma} \right]$, $i \in N$.

The first two items of Corollary 4, that is, (4.A) and (4.B), confirm that income inequality decreases as society exhibits a greater fairness concern. More interestingly, (4.C) reveals that the Gini estimate is positively related with the disproportionately of the power sharing rule, which amount to say that income inequality rises as policymaking power gets more concentrated in the majority winning party. Finally, the swing voter effect over the Gini, given by (4.D), is negative for the poor, since the term in square brackets is positive and $\beta_P < 0$. This is pretty intuitive, since a larger density of independent voters within the poor induces more transfers to the group at the expense of both the rich and the middle class. For these two groups, the sign of (4.D) depends on the parameters of the model and it's therefore undetermined.

5 Empirical Evidence

The main purpose of this section is to assess empirically the equilibrium results found above. To be more specific, we aim to test the following list of hypotheses emerging from Proposition 2 and Corollaries 2 - 4, conveniently summarized in Table 1.

Hypothesis 1 The net transfers to all income groups increase with the gap between the population and the group average pre-tax income.

Hypothesis 2 The net transfers to the poor (resp., non-poor) rise (resp., decrease) with the % of ideologically independent voters among the poor.

Hypothesis 3 The net transfers to the non-poor (resp., poor) decrease (resp., increase) with voters' and parties' fairness concern.

Hypothesis 4 The net transfers to the non-poor (resp., poor) increase (resp., decrease) with power sharing disproportionality.

Hypothesis 5 The Gini coefficient associated with the distribution of after-tax disposable incomes decreases with the % of ideologically independent voters among the poor.

Hypothesis 6 The Gini coefficient associated with the distribution of after-tax disposable incomes decreases with voters' and parties' fairness concern.

Hypothesis 7 The Gini coefficient associated with the distribution of after-tax disposable incomes rises with the disproportionality of the power sharing rule.

5.1 Data

The data employed to carry out the econometric tests is as follows. On the one hand, to assess the last three hypotheses listed above, the dependent variable is the most widely used measure of income inequality, namely, the Gini index, taken from Key Figures of

Table 1: Effects of the parameters over the transfers and the Gini

	Net Transfers (x_i)			Gini
	Poor	MC	Rich	($\hat{G}$)
Income Gap of the Poor ($e - e_P$)	+			
Income Gap of the MC ($e - e_M$)		+		
Income Gap of the Rich ($e - e_R$)			+	
Ideological Neutrality of the Poor (ϕ_P)	+	-	-	-
Fairness Concern of the Poor (α_P)	+			-
Fairness Concern of the MC (α_M)		-		-
Fairness Concern of the Rich (α_R)			-	-
Party Fairness Concern (γ)	+	-	-	-
Electoral Rule Disproportionality (η)	-	+	+	+

LIS, which provides the highest data quality.[29] On the other hand, to examine the first four hypotheses, we use as regressands the real net public transfers received by the three income groups, defined according to micro-data and procedure standards provided by LIS,[30] and taking exchange rates and deflators from Feenstra, Inklaar, and Timmer (2015), The Penn World Table (PWT), available for download at www.ggdc.net/pwt.

To elaborate, given the ability of governments to manipulate different components of public transfers and taxes, we consider three empirical approximations to the group transfers. First, we consider a rather broad measure, removing only social security contributions and income taxes. Second, we consider a narrow definition of the group transfers, given by public assistance transfers minus income taxes. Finally, third, we consider a moderate version of the transfers to the groups, given by the broad definition net of old-age pensions. The moderate version results in a very small sample of country-year observations, so we leave it out of the analysis.

The individual market income is derived from the disposable household income by subtracting the net transfers, in their broad and narrow definitions. The market income, disposable income, and public transfers are all expressed in equivalent terms, following the LIS procedure of dividing each nominal quantity by the square root of the household size. All figures are expressed in thousands of 2005 USD per year, using (LCU/USD) exchange rates and (US) price levels from PWT. We define the poor as the individuals with equivalized market income below 60 percent of the country- and year-specific median income, following EU-SILC definition of risk-of-poverty line. Individuals in the top decile of equivalized incomes are classified as rich; and the remaining individuals constitute the middle class. For the three groups, we aggregate the market incomes, disposable incomes, and public transfers in each country and year using population weights present in LIS.

To test the fourth and seventh hypotheses, the main explanatory variable is

[29] LIS Inequality and Poverty Key Figures, 2015. Luxembourg: LIS. Web address: http://www.lisdatacenter.org.

[30] Luxembourg Income Study Database, (multiple countries; 1967–2010). Luxembourg: LIS. Web address: http://www.lisdatacenter.org

Taagepera's (1986) measure of electoral rule disproportionality. This index is built by dividing the logarithm of the total number of voters by the logarithm of the total number of parliamentary seats, and powering the result to the inverse of the mean electoral district magnitude. The index runs from 1 (proportional representation) to infinity (winner-take-all), with higher values indicating that policymaking power is more disproportionately allocated among political parties, just as the theory of Section 3 postulates. To construct this index, data on the total number of votes for each election and country is collected from IDEA.[31] On the other hand, the total number of seats (and resp., the electoral district magnitudes) are gathered from the Manifesto Project Dataset (MPDS) of Volkens et al. (2015) (and resp., from Carey and Hix's (2011) data set).

The main explanatory variables in the third and sixth hypotheses are voters' and parties' concern with fairness (inequality). To approximate the former, we consider biannual micro-data from the European Social Survey (ESS), for the period 2002-2014 (seven rounds), where respondents are asked the degree in which they agree with the statement that the "government should reduce differences in income levels" in their respective countries.[32] Our measure of voters' concern toward fairness is generated in such a way that it focuses on respondents who have voted in the last election previous to the survey; and it takes a value of 5 if the voter agrees strongly with the above statement; 1 if it disagrees strongly; and 2, 3 and 4, respectively, if the subject disagrees, neither agrees nor disagrees, or agrees.

For the first three waves of ESS, where incomes are classified in Euro-denominated brackets, we assume a uniform distribution inside these brackets to re-classify individuals into country- and year-specific income deciles, consistently with the classification in ESS from wave four. Once we have all individuals classified in income deciles, we assign those in the top decile to the rich group and, using the country-specific average relative poverty rates from EU-SILC, we identify the poor. The middle class is determined once again as the residual of these two groups. We finally obtain our group measure of fairness concern as the weighted average, inside each income group, of the voters' attitude toward differences in income levels. Figure 1 illustrates the results.

Regarding parties' fairness concern, we build an index going from 0 to 1 based on the MPDS question at the party level (per503 Social Justice: Positive), which gathers information about the need for fair treatment of all people; the special protection for the underprivileged; the need for fair distribution of resources; the removal of class barriers; the end of discrimination of racial and sexual nature, etc. We normalize the data to have a minimum of zero and a maximum of 1, and we calculate a vote-weighted average over

[31] International Institute for Democracy and Electoral Assistance (IDEA) Database, (multiple countries; 1945–2014). Stockholm: IDEA. Web address: http://www.idea.int/db.

[32] A strength of ESS data is that it includes responses to the same questions from people in a large number of European and associated countries. This facilitates inter-country comparisons, and makes it possible to relate differences in attitudes across countries to country-specific factors.

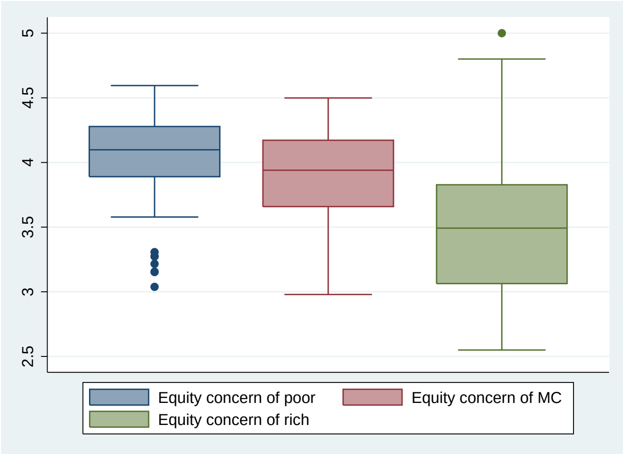

Figure 1: Inequality concern per income group.

the parties that represent 75 percent of the total number of votes.

Finally, to assess the second and the fifth hypotheses, we construct a measure of voter ideological independence or neutrality within each income group. First, we elicit each responding voter's ideological bias by looking at a question in the ESS questionnaire where each subject is asked to place itself on a left-right scale, with the left taking a value of 0, the right a value of 10, and the respondent selecting an integer between 0 and 10. From each individual's left-right placement at ESS, (denoted by LR_i), we build its ideological neutrality (proximity to the center of the ideological spectrum), which takes a value of 1 if the respondent is located at the center (i.e., at 5), 0 if it is at the extremes of the scale (i.e., at either 0 or 10), and $1 - \frac{1}{5}|LR_i - 5|$ otherwise. We obtain then our measure of group ideological independence using the same aggregation procedure applied for voters' fairness concern. Figure 2 displays the distributions per income group.

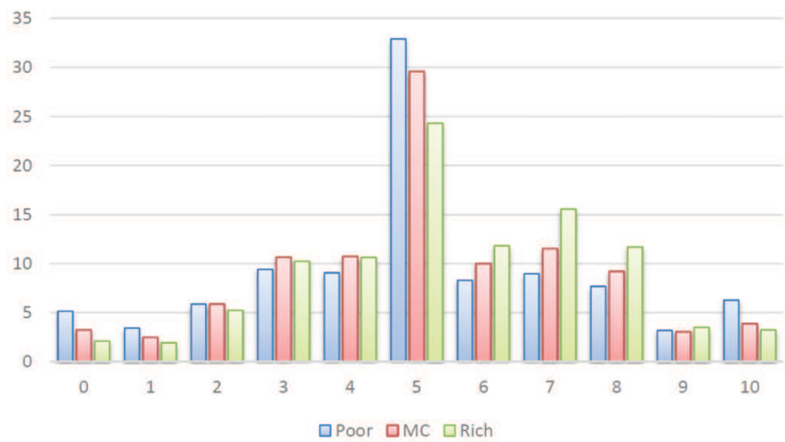

Figure 2: Distribution of ideological neutrality per income group.

To investigate the difference between the means of these distributions, we perform unpaired (two sample) t-Student tests, on samples with 155 country-year observations.

The null hypothesis is that the population means related to two independent and random samples from approximately normal distributions (allowing for unequal variances) are equal. The results from the test suggest that the middle class has significantly higher (at 10 percent significance level) ideological independence than the other groups (t=1.39, p=0.08 when compared to the poor); and that the poor (mean M=0.65, standard deviation SD=0.79) have higher independence than the rich (M=0.64, SD=0.10), though the difference is not significant (t=1.00, p=0.16).

Regarding the distribution of voters' fairness concern, the results obtained from the t-Student test suggest that it is higher for the poor group (M=4.06, SD=0.30) than for the middle class (M=3.90, SD=0.35), with a t-statistic of 4.37 and a corresponding single-tail p-value of virtually 0. The test also points out that the middle class (M=3.90, SD=0.35) has higher inequality concern than the rich (M=3.49, SD=0.48), with a t-statistic of 8.64 and a virtually null p-value. The box plots in Figure 1 provide further evidence regarding the ordering of the inequality concern for the different income groups, aligned with the information coming from the t-tests.

The set of control variables employed in the regressions involving the Gini is standard in the literature on income inequality. First, to control for the possibility of an "inverted U-shaped" relationship between development and inequality, we consider the real (expenditure-side) GDP per capita and its square, measured at purchasing-power parity in 2005 USD from PWT. Second, to account for the fact that a more educated country might enjoy a lower degree of inequality, we borrow a variable from Barro and Lee's (2010) Educational Attainment dataset (interpolated from World Bank) that measures the % of the population older than 25 years with secondary school or higher education.

Third, we control for a possible link between income inequality and trade openness, which is measured as usual as exports plus imports divided by the GDP and multiplied by 100. Fourth, we add a series of control variables related with the size and the structure of the population of each country, such as the total population (in thousands), the % of the population over 65, and the % between 15-64 years old. These data and trade openness are taken from Armingeon et al. (2015), the Comparative Political Data Sets.

Finally, fifth, we consider two institutional variables, namely, the index of democracy from Polity IV dataset (Marshall, Jaggers, and Gurr 2015), and the age of democracy from Carey and Hix (2011), the latter inter- and extra-polated backwards. That is, for example, for a country that we know in a given year has 7 years of democracy and 2 years before had 5 years of democracy, we fill the blanks for 1, 2, 3, 4, and 6 years of democracy. We restrict our pool of country-year observations to a subset with positive values of the polity index in Polity IV, understanding that the link between income redistribution and power sharing investigated in the current paper makes sense primarily in reasonably well functioning democracies.

5.2 Empirical estimations

To start, we regress the net (broad) transfers to the different groups on their market income gaps and the electoral rule disproportionality. This allows us to work with 112 observations when we apply OLS, where we control for the countries' average GDP per capita and its square; and with 114 observations when we apply country-specific fixed effects, accounting for non-observed time-invariant differences among countries.

Table 2: Regressions of the net transfers – Full sample

	Least Squares			Fixed Effects		
	Poor	MC	Rich	Poor	MC	Rich
Income Gap of the Poor ($e - e_P$)	0.49***			0.55***		
	(0.03)			(0.02)		
Income Gap of the MC ($e - e_M$)		0.87***			0.58***	
		(0.11)			(0.09)	
Income Gap of the Rich ($e - e_R$)			0.45***			0.40***
			(0.02)			(0.02)
Electoral Rule Disproportionality (η)	-1.79***	0.82***	3.44***	-24.93**	-6.49	-14.17
	(0.26)	(0.27)	(0.52)	(10.49)	(8.59)	(22.34)
N	112	112	112	114	114	114
FE groups	-	-	-	23	23	23
R^2	0.83	0.61	0.86	0.86	0.32	0.84

Standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Mean values are controlled for but estimates are not reported (see Online Appendix).
R^2 is adjusted-R^2 for least squares and within-R^2 for fixed effects.

The results from these regressions, displayed in Table 2, suggest that there is a positive and statistically significant association between the group's income gap and the net transfers that it receives, providing empirical support to validate Hypothesis 1. The evidence also suggests that higher electoral rule disproportionality is connected to lower net transfers to the poor and to higher net transfers to the non-poor (Hypothesis 4), an association that proves to be statistically significant for each group using OLS and also accounting for fixed effects in the case of the poor.

When considering our narrower definition of transfers, shown in Table 3, we also see a strong association between the income gaps and the group transfers, providing further validation for Hypothesis 1. However, the validation for Hypothesis 4 is relatively more limited. First, the association between electoral rule disproportionality and net transfers to the groups is not statistically significant with fixed effects. Second, in the OLS framework, the disproportionality of the electoral system increases with the average net transfers to individuals in each of the groups rather than only in the non-poor groups. However, as the increases in net transfers are higher for the non-poor than for the poor, increases in the electoral rule disproportionality go hand in hand with increases in the gap between the after-tax incomes of the poor and those of the non-poor, consistently with our theory.

Table 3: Regressions of the net transfers (narrow definition) – Full sample

	Least Squares			Fixed Effects		
	Poor	MC	Rich	Poor	MC	Rich
Income Gap of the Poor ($e - e_P$)	0.13***			0.16***		
	(0.02)			(0.02)		
Income Gap of the MC ($e - e_M$)		0.80***			0.43*	
		(0.24)			(0.26)	
Income Gap of the Rich ($e - e_R$)			0.36***			0.36***
			(0.03)			(0.02)
Electoral Rule Disproportionality (η)	0.48**	1.64***	2.72***	-6.83	6.81	-10.59
	(0.18)	(0.32)	(0.62)	(5.95)	(9.99)	(17.26)
N	88	88	88	90	90	90
FE groups	-	-	-	19	19	19
R^2	0.37	0.42	0.75	0.54	0.04	0.84

Standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Mean values are controlled for but estimates are not reported (see Online Appendix).
R^2 is adjusted-R^2 for least squares and within-R^2 for fixed effects.

Controlling the variability of the group transfers with all the parameters of the equilibrium characterization is not possible due to the insufficient number of observations. However, excluding party fairness and including all other parameters, OLS regressions confirm, albeit on a small number of observations, the significant and positive link between the income gaps and the net transfers the groups receive; and the positive (resp., negative) and significant relation between electoral rule disproportionality and the net transfers to the middle-class and the rich (resp., the poor). Table 4 displays these findings.

As shown in the Table, we do not find that the ideological neutrality of the poor is related as Hypothesis 2 states with higher (resp., lower) net transfers to the poor (resp., non-poor). Moreover, while we find that the transfers to the poor voters rise with their fairness concern, that also happens with the transfers to the other groups, so Hypothesis 3 is not fully validated either. Finally, regressing the transfers on electoral rule disproportionality, parties' fairness concern, and the GDP per capita controls, we find additional evidence in favour of confirming Hypothesis 1 and 4; and also that, ceteris paribus, an increase in parties' fairness concern is associated as Hypothesis 3 postulates with rises (resp., falls) on the transfers to the poor (resp., non-poor), though statistical significance proves to be elusive.

Turning now to the Gini index of inequality on disposable income, subject to the usual controls described in Section 5.1, the evidence offers strong support for Hypothesis 7, suggesting a positive and significant association between power sharing disproportionality

Table 4: Regressions of the net transfers – Restricted samples

	Multiple Regressors			Party Fairness Concern		
	Poor	MC	Rich	Poor	MC	Rich
Income Gap of the Poor ($e - e_P$)	0.45***			0.48***		
	(0.05)			(0.04)		
Income Gap of the MC ($e - e_M$)		0.73**			0.76***	
		(0.27)			(0.27)	
Income Gap of the Rich ($e - e_R$)			0.55***			0.43***
			(0.05)			(0.04)
Ideological Neutrality of the Poor (ϕ_P)	-6.94	-3.69	-10.15			
	(8.87)	(14.54)	(22.92)			
Fairness Concern of the Poor (α_P)	3.62**					
	(1.33)					
Fairness Concern of the MC (α_M)		5.94***				
		(1.83)				
Fairness Concern of the Rich (α_R)			8.28***			
			(2.04)			
Party Fairness Concern (γ)				5.66	-8.77	-23.98
				(5.11)	(6.71)	(14.22)
Electoral Rule Disproportionality (η)	0.96	2.01*	7.55***	-1.15**	1.35**	4.55***
	(0.59)	(0.98)	(1.62)	(0.45)	(0.63)	(1.24)
N	28	28	28	26	26	26
R^2	0.96	0.85	0.96	0.91	0.78	0.92

Standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Mean values are controlled for but estimates are not reported (see Online Appendix).
R^2 is adjusted-R^2.

and the Gini coefficient, both using least squares and fixed effects, and on a sample of 171 country-year observations[33]. This is shown in columns (1) and (2) of Table 5. Like in the other cases, tables showing also the controls are available in the Online Appendix.

The results from fixed effects in column (2) indicate that if a country were to increase its degree of disproportionality, as captured by the Taagepera index, by 0.1 units, keeping other things constant, it would face an increase in the Gini index of inequality of around 2.5 points. The least square results, while not accounting for other countries' unobservables that might affect post-tax inequality (such as institutions not captured in the regressors), allow to compare the effects across different countries, and suggest that the effect of power sharing disproportionality on income inequality, while significant, is much smaller, with a sensitivity of 0.3 points in the Gini for each 0.1 point of increase in

[33]For interpreting the estimated coefficients, recall that a Gini closer to zero indicates a more equal income distribution. Thus, a negative (resp., positive) sign accompanying the coefficient of an explanatory variable indicates a reduction (resp., increase) of inequality followed by an increase in the given variable.

Table 5: Regressions of the Gini index

	Full Sample		Restricted Samples	
	Least Squares	Fixed Effects	Multiple Regressors	Parties' Fairness
Ideological Neutrality of the Poor (ϕ_P)			13.37	
			(11.83)	
Fairness Concern of the Poor (α_P)			-1.05	
			(4.31)	
Fairness Concern of the MC (α_M)			6.42	
			(4.76)	
Fairness Concern of the Rich (α_R)			-1.70	
			(2.11)	
Party Fairness Concern (γ)				-12.80**
				(6.14)
Electoral Rule Disproportionality (η)	2.81***	25.91**	3.58**	2.29**
	(0.45)	(12.29)	(1.40)	(0.93)
N	171	171	30	40
FE groups	-	26	-	-
R^2	0.43	0.22	0.81	0.62

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Mean values are controlled for but estimates are not reported (see Online Appendix).
R^2 is adjusted-R^2 for least squares and within-R^2 for fixed effects.

the Taagepera index.

As it happens with the transfers, controlling the Gini for all other parameters of the model is not possible due to the insufficient number of observations. However, ignoring parties' concern with fairness, and using a restricted set of controls consistent with the low number of observations (given by GDP per capita, education, openness, and the structure of the population), the OLS regression displayed in column (3) of Table 5 confirms the positive and significant link between electoral rule disproportionality and income inequality. However, this regression does not suggest that a higher concern of the electorate with inequality is related to a significantly lower Gini index (Hypothesis 6). And it does not provide evidence confirming that higher ideological neutrality among the poor is associated with lower income inequality (Hypothesis 5).

Finally, regressing the Gini coefficient against electoral rule disproportionality, parties' fairness concern, and the full set of controls, leads to results that confirm Hypothesis 7, and provide some validation for Hypothesis 6. This last regression is shown in column (4) of Table 5. As can be seen from the bottom row of the Table, the variation in the Gini index of the disposable income distribution is fairly well explained, as captured by the R^2. Also, the F-statistics (not tabulated) indicate that these models cannot be rejected on any conventional significance level.

6 Final Remarks

In this paper, we've studied the effect of power sharing at the policymaking process over income redistribution and inequality, in a model of redistributive politics with fairness concern. Besides showing the existence of a unique pure-strategy Nash equilibrium, we've also characterized the equilibrium transfers of the groups in a tractable version of the model. This characterization sheds light not only on the structure of the group transfers, which are made of altruistic and tactical components of redistribution, but also on how the latter vary with their main determinants, namely: (i) the gap between the population and the group average pre-tax incomes; (ii) the ideological neutrality gap of the poor, (iii) parties' and voters' concern with inequality, and (iv) electoral rule disproportionality. In particular, the theoretical and empirical results suggest that the transfers to the more responsive group of voters (i.e., the middle class) and the Gini index of after-tax disposable incomes both rise as policymaking power gets more concentrated in the winning party.

To keep the analysis tractable, our equilibrium characterization and the comparative statics results derived from it rest on the assumption that parties care *equally* about fairness. The Online Appendix offers some preliminary insights about how asymmetric party fairness might enter into and modify our inquiry. In that regard, the outcome for the uniform distribution case indicates that in contrast with the symmetric case, when parties care differently about inequality, their transfer policies diverge at the equilibrium. More importantly, compared again with the symmetric situation, both parties are shown to campaign on a lower level of tactical redistribution, particularly to the more responsive group of voters, implementing as a result a more egalitarian distribution of disposable income. This occurs because electoral competition between two *differentiated* fair-minded parties becomes less fierce, to which parties react by reducing the level of targeted spending that they are willing to trade against equity in their search for votes.[34]

Precisely, to focus the analysis of electoral competition on this trade-off between equity and votes and on how it varies with power sharing, the model studied above abstracts from the fact that redistribution generate most probably a deadweight loss in the economy. If so, then voters' preferences over redistribution might express not just a concern for the individual well-being and some ideal of social justice, but also for economic efficiency (e.g. for the mean income of the economy, like in Wittman 2005). In that case, an interesting problem to look at in future research is how the efficiency-equity trade-off affects income redistribution and inequality in democracies with different power sharing regimes.

Finally, another interesting problem that goes beyond the scope of this paper refers to the dynamics of redistribution and inequality in the presence of fairness and power

[34] We reckon a similar situation would possibly arise when the electorate is biased in favor of one party. That is, if $v^C(\mathbf{x}, \mathbf{x}) > 1/2$ for some $C = A, B$ and $\mathbf{x} \in X$, which means that the distribution of ideological preferences within some groups is such that one of the parties is more popular than the other (gets a higher vote share) when both propose the same redistributive policy $\mathbf{x} \in X$.

sharing. Alesina et al. (2012) has recently provided some results on this matter within the more traditional framework of "winner-take-all" rather than "consensual" democracies, to paraphrase Lijphart (1984). Among other things, that analysis requires, first, to endogenize the initial income distribution, that in our case like in a snapshot is taken as given, assuming for example that it results from some effort carry out by the economic agents, together with an exogenous distribution of innate abilities and a random component representing how lucky each person is in life. And second, it demands a more involved definition of fairness, which should possibly include not only an ideal of intra- but also of inter-generational social justice. We hope to contribute on this and the other two extensions briefly commented above in a future work.

A Appendix A: missing proofs

Proof of Proposition 1 To show that $\mathcal{G}(\gamma^A,\, \gamma^B) = (X,\, \Pi^C(\,\cdot,\, \gamma^C))_{C=A,B}$ has a pure-strategy equilibrium, we employ Debreu-Glicksberg-Fan's existence result. First, note that the strategy space X is non-empty, compact, and convex. Second, each function $\Pi^C(\mathbf{x}^A, \mathbf{x}^B, \gamma^C)$ is continuous on $(\mathbf{x}^A, \mathbf{x}^B) \in X^2$. Thus, it remains to prove that, under condition $\mathbb{C}$, the conditional payoff $\Pi^C(\,\cdot\,, \mathbf{x}^{-C},\, \gamma^C)$ is strictly quasi-concave on X.

Fix any policy $\overline{\mathbf{x}}^B \in X$, and consider the resulting conditional payoff function $\Pi^A(\,\cdot\,, \overline{\mathbf{x}}^B,\, \gamma^A)$ of party A. The proof for party B is similar. Note that the second term of party A's conditional payoff, namely, $-\,\gamma^A\,\frac{1}{2}\cdot\sum_{i\in N} n_i\,(y_i^A - y^A)^2$, is strictly concave in the party's own strategy. Moreover, the first term $(1-\gamma^A)\cdot\rho^A$ is a strictly increasing transformation of v^A. Thus, to prove that $\Pi^A(\,\cdot\,, \overline{\mathbf{x}}^B,\, \gamma^A)$ is strictly quasi-concave on X, it suffices to show that the vote share $v^A(\mathbf{x}^A, \overline{\mathbf{x}}^B)$ is strictly concave in $\mathbf{x}^A$.

Recall that $v^A(\mathbf{x}^A, \overline{\mathbf{x}}^B) = \sum_{i\in N} n_i\, v_i^A(\mathbf{x}^A, \overline{\mathbf{x}}^B)$, with $v_i^A(\mathbf{x}^A, \overline{\mathbf{x}}^B) = F_i(u_i(\mathbf{x}^A) - u_i(\overline{\mathbf{x}}^B))$. Consider the Hessian matrix associated to any $v_i(\,\cdot\,, \overline{\mathbf{x}}^B)$, namely, $H_i(\mathbf{x}^A) = \left[\frac{\partial^2\, v_i(\mathbf{x}^A, \overline{\mathbf{x}}^B)}{\partial x_i^A \partial x_j^A}\right]_{j\in N}$. Showing that $H_i(\mathbf{x}^A)$ is negative definite requires that, starting with negative, the leading principal minors of $H_i(\mathbf{x}^A)$ alternate their sign. It is easy to show that, since the second-order partial derivatives $\frac{\partial^2 u_i(\mathbf{x}^A)}{\partial x_i^A \partial x_j^A} = 0$ for all $i \neq j$, $i, j \in N$, the matrix $H_i(\mathbf{x}^A)$ is negative definite if the following conditions hold:

$$\frac{\partial^2 v_i(\mathbf{x}^A, \overline{\mathbf{x}}^B)}{\partial x_i^A \partial x_i^A} < 0 \quad \Longleftrightarrow \quad r_i(t_i) < \left(\xi_{ii}(\mathbf{x}^A)\right)^{-1}$$

$$\begin{vmatrix} \frac{\partial^2 v_i(\mathbf{x}^A, \overline{\mathbf{x}}^B)}{\partial x_i^A \partial x_i^A} & \frac{\partial^2 v_i(\mathbf{x}^A, \overline{\mathbf{x}}^B)}{\partial x_i^A \partial x_j^A} \\ \frac{\partial^2 v_i(\mathbf{x}^A, \overline{\mathbf{x}}^B)}{\partial x_j^A \partial x_i^A} & \frac{\partial^2 v_i(\mathbf{x}^A, \overline{\mathbf{x}}^B)}{\partial x_j^A \partial x_j^A} \end{vmatrix} > 0 \quad \Longleftrightarrow \quad r_i(t_i) < \left(\xi_{ii}(\mathbf{x}^A) + \xi_{ij}(\mathbf{x}^A)\right)^{-1},\ i \neq j$$

$$|H_i(\mathbf{x}^A)| < 0 \quad \Longleftrightarrow \quad r_i(t_i) < \left(\sum_{j\in N} \xi_{ij}(\mathbf{x}^A)\right)^{-1},$$

where $\xi_{ij}(\mathbf{x}^C) = -\frac{[\partial u_i(\mathbf{x}^C)/\partial x_j^C]^2}{\partial^2 u_i(\mathbf{x}^C)/\partial x_j^C \partial x_j^C}$ and $r_i(t_i) = \frac{f_i'(t_i)}{f_i(t_i)}$, with $t_i = u_i(\mathbf{x}^A) - u_i(\overline{\mathbf{x}}^B)$, and $i,\, j \in N$. Thus, since $\left(\sum_{j \in N} \xi_{ij}(\mathbf{x}^A)\right)^{-1} < \left(\xi_{ii}(\mathbf{x}^A) + \xi_{ij}(\mathbf{x}^A)\right)^{-1} < \left(\xi_{ii}(\mathbf{x}^A)\right)^{-1}$, condition $\mathbb{C}$ guarantees that $v_i(\,\cdot\,, \overline{\mathbf{x}}^B)$ is strictly concave on X, which proves as explained before the strict quasi-concavity of the conditional payoff function $\Pi^A(\,\cdot\,, \overline{\mathbf{x}}^B,\, \gamma^A)$.

Finally, equilibrium uniqueness follows from the shape (i.e., strict quasi-concavity) of the conditional payoffs $\Pi^C(\,\cdot\,, \mathbf{x}^{-C},\, \gamma^C)$, $C = A, B$. ∎

Proof of Proporsition 2 First, notice that equilibrium symmetry (i.e., $\mathbf{x}^A = \mathbf{x}^B$) follows from the fact that, given the policy of the other party, both political organizations face the same optimization problem when $\gamma^A = \gamma^B = \gamma \in [0, 1]$, namely,[35]

$$\max_{\mathbf{x}^C} \; \Pi^C(\mathbf{x}^A, \mathbf{x}^B)$$

$$\text{s.t.} \quad \sum_{i \in N} n_i x_i^C = 0, \tag{6}$$

$$x_i^C + e_i \geq 0 \text{ for all } i \in N, \tag{7}$$

$$e_R + x_R^C \geq e_M + x_M^C, \tag{8}$$

$$e_M + x_M^C \geq e_P + x_P^C, \tag{9}$$

$$\mathbf{x}^{-C} \text{ given.}$$

Without loss of generality, consider next party A's problem. The Lagrange function is $\mathcal{L} = \Pi^A(\mathbf{x}^A, \mathbf{x}^B) + \lambda[0 - \sum_{i \in N} n_i x_i^A] + \sum_{i \in N} \mu_i(x_i^A + e_i) + \delta_1(e_R + x_R^A - e_M - x_M^A) + \delta_2(e_M + x_M^A - e_P - x_P^A)$, where λ, μ_i, δ_1 and δ_2 are the multipliers associated with the constraints listed in (6)-(9). Consider first the case where $\lambda > 0$, $\mu_i = 0$ for all $i \in N$, $\delta_1 > 0$, and $\delta_2 = 0$.[36] Under this configuration of values of the Lagrange multipliers, the system of first-order conditions reduces to (7) and (9) together with the following equations:

$$\frac{\partial \Pi^A}{\partial x_R^A} - \lambda n_R + \delta_1 = 0, \tag{10}$$

$$\frac{\partial \Pi^A}{\partial x_M^A} - \lambda n_M - \delta_1 = 0, \tag{11}$$

$$\frac{\partial \Pi^A}{\partial x_P^A} - \lambda n_P = 0, \tag{12}$$

$$\sum_{i \in N} n_i\, x_i^A = 0, \tag{13}$$

$$e_R + x_R^A - e_M - x_M^A = 0. \tag{14}$$

[35]To save on notation, notice that when parties have identical fairness concern, we simply write the the party payoffs as a function of the strategy profile, ignoring γ from the list of arguments.

[36]Recall that no income group is fully expropriated (i.e., be left with a non-positive after-tax income) given the restriction on the densities $\phi_P > \phi - 2\phi_\alpha e$.

Moreover, since $\mathbf{x}^A = \mathbf{x}^B$, the vote share of party A is 1/2, implying that

$$\frac{\partial \Pi^A(\mathbf{x}^A, \mathbf{x}^B)}{\partial x_i^A} = (1-\gamma)\,\eta\,\frac{\partial v^A(\mathbf{x}^A, \mathbf{x}^B)}{\partial x_i^A} - \gamma\, n_i\,(\tilde{e}_i + x_i^A), \tag{15}$$

where $\tilde{e}_i = e_i - e$ and $\frac{\partial v^A(\mathbf{x}^A,\mathbf{x}^B)}{\partial x_i^A} = n_i\phi_i - 2n_i(\tilde{e}_i + x_i^A)\phi_\alpha$. Adding (10) and (11), we have that $\frac{\partial \Pi^A}{\partial x_R^A} + \frac{\partial \Pi^A}{\partial x_M^A} - \lambda n_R - \lambda n_M = 0$, which implies using (15) that

$$\lambda = \frac{n_M}{n_M + n_R}[(1-\gamma)\eta\phi_M - (\tilde{e}_M + x_M^A)D] + \frac{n_R}{n_M + n_R}[(1-\gamma)\eta\phi_R - (\tilde{e}_R + x_R^A)D], \tag{16}$$

where $D = (1-\gamma)\eta 2\phi_\alpha + \gamma$. Notice that from (12) and (15), it also follows that

$$\lambda = (1-\gamma)\eta\phi_P - (\tilde{e}_P + x_P^A)D. \tag{17}$$

Combining (16) and (17) together with (14),

$$x_P^A = \frac{(1-\gamma)\eta}{D}\frac{\phi_P - \phi}{n_R + n_M} + e_M + x_M^A - e_P. \tag{18}$$

Substituting (14) and (18) into (13), we get the transfer to the middle class, namely, $x_M^A = e - e_M + \beta_M(\phi - \phi_P)$, where $\beta_M = \frac{(1-\gamma)\,\eta\,\sigma_P}{(1-\gamma)\,2\,\eta\,\phi_\alpha + \gamma}$ and $\sigma_P = \frac{n_P}{1-n_P}$. The transfer to the rich and the poor are obtained by replacing x_M^A into (14) and (18), respectively. Moreover, using (17), we have that $\lambda = (1-\gamma)\eta\phi$, which is strictly positive as required. Finally, it's easy to verify that these critical values of x_i^A satisfy (7) and (9). Therefore, they constitute the solution of party's A constrained optimization problem. It is left for the reader to check that any other configuration of values of the Lagrange multipliers violates one or more of the first-order conditions. ∎

Proof of Corollary 1 Without loss of generality, we show the result for party A. Recall that A maximizes the payoff function $\Pi^A = (1-\gamma)\rho^A - \gamma\frac{1}{2}\sum_{i\in\mathcal{N}} n_i(y_i^A - y^A)^2$ with respect to $\mathbf{x}^A \in X$ subject to the constraints listed in (6)-(9). The first part of Π^A, i.e., maximizing $(1-\gamma)\rho^A$, is equivalent to maximizing $(1-\gamma)\,\eta\,\sum_{i\in\mathcal{N}} n_i\, f_i(0)\, u_i(\mathbf{x}^A)$, because these two have the same first-order partial derivatives, namely,

$$(1-\gamma)\,\eta\, n_i\, f_i(0)\, u_i'(\mathbf{x}^A)$$

With regard to the second part of party A's payoff function, notice first that sum of voters' utility functions $\sum_{i\in\mathcal{N}} n_i\, u_i$ is

$$\sum_{i\in\mathcal{N}} n_i\, u_i = y - \hat{\alpha}\left[\sum_{i\in\mathcal{N}} n_i\,(y_i^A - y^A)^2\right],$$

where $\hat{\alpha} = \sum_{i \in \mathcal{N}} n_i \, \alpha_i$. Thus, maximising $-\gamma \frac{1}{2} \sum_{i \in \mathcal{N}} n_i (y_i^A - y^A)^2$ is equivalent to maximising $\gamma \frac{1}{2\hat{\alpha}} \sum_{i \in \mathcal{N}} n_i u_i(\mathbf{x}^A)$, which proves the desired result, that is, $\mathbf{x}^A = \arg\max_{\mathbf{x} \in X} \sum_{i \in \mathcal{N}} d_i \, u_i(\mathbf{x})$, with $d_i = (1-\gamma) \, \eta \, n_i \, f_i(0) + \gamma \, \frac{n_i}{2 \sum_{i \in \mathcal{N}} n_i \alpha_i}$. ∎

B Appendix B: summary statistics & observations

Table 6: Summary statistics for the regressions of the net transfers (LIS)

Variable	Obs.	Mean	SD	Min.	Max.
Net Transfers to the Poor – Broad Def.	114	10.46	5.36	1.41	28.03
Net Transfers to the MC – Broad Def.	114	-4.23	3.50	-14.48	3.68
Net Transfers to the Rich – Broad Def.	114	-21.99	12.15	-50.49	1.57
Net Transfers to the Poor – Narrow Def.	90	1.32	1.77	-0.90	9.03
Net Transfers to the MC – Narrow Def.	90	-4.49	2.92	-15.72	-0.12
Net Transfers to the Rich – Narrow Def.	90	-19.25	9.75	-43.50	-0.74
Average Initial Income – Broad Def.	114	26.09	11.21	2.44	52.60
Average Initial Income of the Poor – Broad Def.	114	4.20	1.95	0.36	8.68
Average Initial Income of the MC – Broad Def.	114	29.50	12.85	2.67	60.60
Average Initial Income of the Rich – Broad Def.	114	75.91	32.85	7.78	149.24
Average Initial Income – Narrow Def.	90	28.59	11.87	3.47	53.40
Average Initial Income of the Poor – Narrow Def.	90	9.34	4.32	1.17	18.60
Average Initial Income of the MC – Narrow Def.	90	28.38	11.66	3.37	51.32
Average Initial Income of the Rich – Narrow Def.	90	72.74	30.80	8.55	124.32
Ideological Neutrality of the Poor	28	0.67	0.06	0.54	0.79
Ideological Neutrality of the MC	28	0.68	0.06	0.56	0.78
Ideological Neutrality of the Rich	28	0.64	0.07	0.49	0.77
Fairness Concern of the Poor	28	3.94	0.30	3.11	4.45
Fairness Concern of the MC	28	3.73	0.35	3.01	4.48
Fairness Concern of the Rich	28	3.28	0.46	2.48	4.43
Party Fairness Concern	27	0.11	0.06	0.007	0.245
Electoral Rule Disproportionality	114	1.79	0.89	1.007	3.304
Per Capita Income between 15K and 20K	112	0.30	0.46	0	1
Per Capita Income above 20K	112	0.61	0.48	0	1

All monetary values measured in thousands of 2005 USD.

Table 7: Summary statistics for the regressions of the Gini index (LIS)

Variable	Obs.	Mean	SD	Min.	Max.
Gini Index	171	28.82	4.05	19.70	37.1
Ideological Neutrality of the Poor	30	0.68	0.061	0.55	0.80
Ideological Neutrality of the MC	30	0.68	0.06	0.56	0.79
Ideological Neutrality of the Rich	30	0.64	0.07	0.50	0.78
Fairness Concern of the Poor	30	3.94	0.29	3.17	4.46
Fairness Concern of the MC	30	3.75	0.35	3.01	4.49
Fairness Concern of the Rich	30	3.30	0.44	2.62	4.43
Party Fairness Concern	40	0.12	0.09	0.01	0.50
Electoral Rule Disproportionality	171	1.62	0.81	1.01	3.31
Real Per Capita GDP (at chained PPPs)	171	25.41	9.51	6.11	66.72
Total Population (in thousands)	171	40,431	61,459	1,333	309,326
Share of the Population with Secondary School	171	0.33	0.15	0.05	0.73
Share of the Population between 15 and 64 y.o.	171	66.90	1.91	60.45	72.03
Share of Population with or above 65 y.o.	171	14.52	2.43	8	22.1
Index of Democracy	171	9.85	0.46	7	10
Age of Democracy	171	55.44	26.45	2	91
Openness of the Economy	171	75.49	39.01	17.11	182.85

All monetary values measured in thousands of 2005 USD.

Table 8: Number of observations by country and period of analisis – Full sample

Country	Transfers	Gini
Australia	8	8
Austria	1	6
Belgium	0	6
Canada	12	12
Czech Republic	5	5
Denmark	7	7
Estonia	0	4
Finland	3	7
France	2	7
Germany	4	5
West Germany	4	6
Greece	3	5
Hungary	0	6
Ireland	4	8
Israel	2	0
Italy	3	11
Japan	1	1
Netherlands	4	8
Norway	8	8
Poland	5	6
Romania	0	1
Slovakia	1	4
Spain	3	8
Sweden	8	7
Switzerland	5	5
United Kingdom	11	10
United States	10	10
From	1967	1971
To	2010	2010
Total No Observations	114	171

Table 9: Observations in the regressions of the transfers by country and year – Full sample

Country	Years
Australia	1981 1985 1989 1995 2001 2003 2008 2010
Austria	2004
Canada	1971 1975 1981 1987 1991 1994 1997 1998 2000 2004 2007 2010
Czech Republic	1996 2002 2004 2007 2010
Denmark	1987 1992 1995 2000 2004 2007 2010
Finland	2004 2007 2010
France	2005 2010
Germany	2000 2004 2007 2010
West Germany	1981 1983 1984 1989
Greece	2004 2007 2010
Ireland	1987 2004 2007 2010
Israel	1992 2001
Italy	2004 2008 2010
Japan	2008
Netherlands	1999 2004 2007 2010
Norway	1979 1986 1991 1995 2000 2004 2007 2010
Poland	1995 1999 2004 2007 2010
Slovakia	2010
Spain	2004 2007 2010
Sweden	1967 1975 1981 1987 1992 1995 2000 2005
Switzerland	1982 1992 2000 2002 2004
United Kingdom	1969 1974 1979 1986 1991 1994 1995 1999 2004 2007 2010
United States	1974 1979 1986 1991 1994 1997 2000 2004 2007 2010

Table 10: Observations in the regressions of the Gini by country and year – Full sample

Country	Years
Australia	1981 1985 1989 1995 2001 2003 2008 2010
Austria	1987 1994 1995 1997 2000 2004
Belgium	1985 1988 1992 1995 1997 2000
Canada	1971 1975 1981 1987 1991 1994 1997 1998 2000 2004 2007 2010
Czech Republic	1996 2002 2004 2007 2010
Denmark	1987 1992 1995 2000 2004 2007 2010
Estonia	2000 2004 2007 2010
Finland	1987 1991 1995 2000 2004 2007 2010
France	1978 1984 1989 1994 2000 2005 2010
Germany	1994 2000 2004 2007 2010
West Germany	1973 1978 1981 1983 1984 1989
Greece	1995 2000 2004 2007 2010
Hungary	1991 1994 1999 2005 2007 2009
Ireland	1987 1994 1995 1996 2000 2004 2007 2010
Italy	1986 1987 1989 1991 1993 1995 1998 2000 2004 2008 2010
Japan	2008
Netherlands	1983 1987 1990 1993 1999 2004 2007 2010
Norway	1979 1986 1991 1995 2000 2004 2007 2010
Poland	1992 1995 1999 2004 2007 2010
Romania	1997
Slovakia	1996 2004 2007 2010
Spain	1980 1985 1990 1995 2000 2004 2007 2010
Sweden	1975 1981 1987 1992 1995 2000 2005
Switzerland	1982 1992 2000 2002 2004
United Kingdom	1974 1979 1986 1991 1994 1995 1999 2004 2007 2010
United States	1974 1979 1986 1991 1994 1997 2000 2004 2007 2010

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