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On altruistic and electoral income redistribution: Theory and data*

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Abstract

We analyze a political competition model of redistributive policies. We show that the net transfers to the income groups consist of two parts, called *altruistic* and *electoral redistribution*. In accordance with the theory, the empirical evidence from a sample of developed and developing democracies strongly supports a positive and significant association between: (i) the net group transfers and the initial income gaps, and (ii) the net transfers to the non-poor (and respectively, the after-tax Gini coefficient) and power sharing disproportionality.

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1 Introduction

Since the mid twenty century an increasingly important activity of government in western democracies consists in redistributing income among different socio-economic groups. Quite often, this activity is not only motivated by the altruistic goal of reducing income

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disparities among citizens, but also by the tactical objectives of the political actors competing in the elections. In this paper, we study several determinants of *altruistic* and *electoral* redistributive policies, emphasising in particular the role of fairness concern, ideology, and political power sharing. In addition, we confront our predictions to the data using a panel dataset of mature and developing democracies.

Following recent research on fairness and redistribution, pioneered by Alesina and Angeletos (2005a,b),[1] we first modify the canonical model of redistributive politics due to Lindbeck and Weibull (1987) 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 sacrifice personal gains and share resources with others to eliminate inequalities that they view as unfair.

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) 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 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 resources ought to be distributed in society.

Besides introducing fairness into the utility functions, we also extend the 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 the intensity of electoral competition.

Following the modelling strategy of Saporiti (2014), Matakos, Troumpounis and Xef-

[1]We discuss in greater detail the literature related to our paper in Section 5.

[2]Experimental and neural evidence of egalitarian motives in humans 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).

[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 functions (Engelmann and Strobel 2004).

teris (2015), and Herrera, Morelli, and Nunnari (2016), we represent power sharing in our framework with the help of a *contest success function.* 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 to 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. First, we show that the equilibrium redistributive policies of the modified probabilistic voting model can be 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.

Second, we derive from our equilibrium characterization a number of testable predictions that guide the empirical work. Among them, our analysis shows that the net transfers to all groups rise with the income gaps. 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 electoral redistribution and 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 net group transfers is driven by power sharing disproportionality.

With regard to the after-tax income inequality, we prove that the Gini index after redistribution increases as policymaking power gets more concentrated in the majority winning party. The latter as well as the effect of power sharing over the net transfers take place if and only if parties are fair-minded, in which case the intensity of the electoral competition (determined by power sharing) affects parties' willness to trade off equity for votes. By contrast, if parties maximize simply the expected vote shares, targeted

[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 the electoral outcomes and parties' direct influence over the policymaking process.

spending to swing voter groups is not affected by the power sharing regime.

Finally, third, 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 on the probabilistic voting model of income redistribution, and the empirical analysis of income inequality under different electoral rules. To start, we build a panel of countries and years based on macro and micro information provided by the Luxembourg Income Study (LIS), 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.[6] 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.[7]

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 and significant association between (i) the net group transfers and the income gaps, and (ii) the net transfers to the non-poor (and respectively, the after-tax Gini coefficient) and Taagepera's (1986) index of electoral rule disproportionality.

The data also show (albeit in a rather smaller sample of observations) a negative and significant association between the Gini and parties' distaste for inequality. However, we don't find significant evidence of a relationship between the net group transfers and the ideological independence of the poor. 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 is also consistent with the fact that fair-minded parties engage less on tactical spending. Finally, we do find (again in a relatively small sample)

[5]See Table 6 at the end of the paper for details about the observations informing the regressions.

[6]The Online Appendix also considers the Gallegher's (1991) index, which is another well-known measure of political power sharing. The results reported below are similar under the two specifications.

[7]For the sake of conciseness, the reader is referred to Section 4 for further details about the data and the definition of Taagepera's (1986) index.

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 is organised as follows. We set up the model in Section 2. The theoretical results are derived in Section 3. Section 4 describes the hypotheses to be tested, the data, and it displays the regression results. Section 5 concludes the paper summarizing the main findings and discussing the related literature. For convenience, proofs are relegated to Appendix A.

2 The Model

2.1 Voters

Consider a continuum of voters (large electorate) divided into three disjoined groups: the rich (R), the middle class (M), and the poor (P). Let $n_i \in (0,1)$ denote the size of group $i \in N$, with $\sum_{i \in N} n_i = 1$, and let $\sigma_i = n_i/(1-n_i)$ be group i's relative size in relation to the other groups. Suppose $e_i > 0$ denotes 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 might not be seen as *fair* by the electorate. To represent voters' 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 under the distribution $\mathbf{z} \in Z$, $z = \sum_{i \in N} n_i \, z_i$ is the population mean income, 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 4.1, we assume that $\alpha_P > \alpha_M > \alpha_R$, reflecting the fact that richer groups display a greater dislike towards income redistribution (see Figure 1).

The preferences shown in equation (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.[8] The first term of the right-hand side denotes voter i's *selfish utility* over his income z_i. The second term, i.e., the expression

[8] 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).

$-\alpha_i \sum_{i \in N} n_i \left(z_i - z\right)^2$, 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.

2.2 Political process

To remedy any social injustice created by the initial allocation of resources, there is a political process that redistributes income across groups through a tax-and-transfer policy. Let $x_i \in \mathbb{R}$ denote a net transfer 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 disposable incomes $y_i = e_i + x_i$ after redistribution preserves the ordering of the initial incomes of the groups, that is, $y_R \geq y_M \geq y_P$.[9]

There are two political parties, indexed by $C \in \{A, B\}$, that compete in an election proposing simultaneously and independently a redistributive policy $\mathbf{x}^C \in X$.[10] Like in Lindbeck-Weibull model, 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. 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 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.[11] In addition, the second inequality, that is, $\phi > \phi_P$, rules out the less compelling 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

[9] Like in Lindbeck-Weibull model, under *income sorting* the ranking of the groups after redistribution changes in equilibrium in such a way that the rich becomes the lowest income group. This is not very realistic, since non-rich voters do not seem to possess in western democracies the political power to carry out such level of expropriation. Despite this, when income sorting is permitted, the Online Appendix shows that the main qualitative properties of the equilibrium transfers are similar.

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

[11] 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.

non-positive after-tax income, we 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 independent voters' fairness concern.

At the election, each voter votes sincerely for the party's proposal that offers higher utility.[12] 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 $v^B = 1 - v^A$.

After the election, the winning party and the opposition jointly determine the tax-and-transfer scheme $\mathbf{x} \in X$ in accord with their policy platforms $\mathbf{x}^C$ and their relative political strengths ρ^C. To be precise, we assume that $\mathbf{x} = \rho^A\, \mathbf{x}^A + \rho^B\, \mathbf{x}^B$, 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 $\rho^B = 1 - \rho^A$.[13]

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. To be precise, we assume that the power sharing function ρ^C is given by

$$\rho^C = \frac{1}{1 + \left(\frac{1-v^C}{v^C}\right)^\eta}, \tag{2}$$

where $\eta \geq 1$ is a parameter interpreted below as the proportionality of the electoral rule.[14]

Simple algebraic manipulation shows that (2) implies that $\rho^C/\rho^{-C} = (v^C/v^{-C})^\eta$, which is Theil's (1969) well-known hypothesis about how vote shares translate 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 vote share. As the parameter η rises above 1, the electoral rule gets more disproportionate and

[12]This entails no loss of generality because the probability of being pivotal at the election is zero given the continuum of voters.

[13]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.

[14]An alternative to (2) 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 (2). Details are omitted for the sake of brevity, but they are available in the Online Appendix.

biased in favour of the majority winning party.[15] In the limit, as η approaches infinity, (2) 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 of party C is defined as $\Pi^C(\mathbf{x}^A, \mathbf{x}^B) = (1-\gamma)\cdot\rho^C - \gamma\,\frac{1}{2}\cdot\sum_{i\in N} n_i\,(y_i^C - y^C)^2$, where $y^C = \sum_{i\in N} n_i\, y_i^C$ is the mean after-tax income under party C's policy, and $\gamma\in[0,1]$ denotes party fairness concern.[16] When $\gamma = 0$, parties maximize their expected vote shares. At the other extreme when $\gamma = 1$, they are purely altruistic and seek to achieve an egalitarian distribution of income. In between these limit cases, parties compete motivated by *both* power and fairness.

2.3 Timing

Let $\mathcal{G} = (X,\, \Pi^C)_{C=A,B}$ denote the ***redistributive election game*** sketched 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. Fourth, the vote and the power shares are determined and, together with the parties' proposals, they determine the implemented policy. Finally, fifth, parties and voters receive their respective payoffs.

3 Equilibrium

In this section, we characterize the equilibrium transfers of the redistributive election game and we derive several testable predictions. Under fairly mild conditions, the existence of a unique pure strategy equilibrium in a more general version than our game $\mathcal{G}$ has been recently proved by Le, Saporiti and Wang (2017).[17]

[15] 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.

[16] Alternatively, γ could be seen as the reputational cost for the party of campaigning on distributive policies perceived by the electorate as "socially insensible" (i.e., the cost of building the image of being a "nasty party" that only cares about the privileged few and not the many, as the British Conservative Prime Minister, Theresa May, put it in her 2002 party conference speech). The Online Appendix offers further results for the *asymmetric* case where $\gamma_A \neq \gamma_B$.

[17] In the case of smooth payoffs, 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,

Proposition 1 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

$$x_i^C = \underbrace{(e - e_i)}_{AR} + \underbrace{\beta_i \, (\phi - \phi_P)}_{ER}, \; C = A, B, \tag{3}$$

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

The characterization given in Proposition 1 points out that despite 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 a similar redistributive policy. More importantly, it also shows that the tax-and-transfer policy to which parties converge consists of two parts:

- A first part called ***altruistic redistribution*** (AR), 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 ***electoral redistribution*** (ER) carried out to increase voters' support, and that depends on 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' inequality concern.

The assumptions on the income distribution and on the group densities imply that the equilibrium transfers to the middle class are positive. For the other groups, the sign is indeterminate because AR and ER work in 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.

From the utilitarian viewpoint, the equilibrium displayed in Proposition 1 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' utilities according with the group sizes, the ex-ante distribution of ideological preferences, the fairness concern parameters, and the electoral rule disproportionality. To be more precise:

Le, Saporiti and Wang (2017) impose a sufficient condition that generalizes Lindbeck and Weibull's (1987), but is stronger due to the presence of other regarding preferences. Roughly speaking, it 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.

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 $d_i = (1-\gamma)\,\eta\, n_i\, f_i(0) + \gamma\, \frac{n_i}{2\sum_{i\in\mathcal{N}} n_i\alpha_i}$.

Besides revealing that altruistic redistribution only varies (rises) with the income gaps, Proposition 1 offers some insight as to how electoral redistribution is affected by the other parameters of the model. Corollaries 2-3 below collect these results.[18] To start, notice that an increase in ϕ_P raises the transfers to the poor, as is indicated by (2.A), because they become more responsive to policy and their votes are easier to swing. 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 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 indeterminate, meaning that in contrast with Lindbeck and Weibull (1987), electorally motivated transfers do not necessarily rise in *all* groups with the percentage of swing voters.[19] 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 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 preferences. Therefore, the total effect of a change of ϕ_M (resp., ϕ_R) over x_i^C is ambiguous.

The second set of comparative statics results points out that the effect of (either citizens' or parties') inequality concern over ER-transfers is negative for the middle class and the rich, who benefit from this type of 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 elections. As was pointed out before, AR-transfers are not directly affected by inequality concern.

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

[19]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.

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 $t = \alpha_i$, γ, η, 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) $\frac{\partial \beta_R}{\partial \gamma} = \frac{\partial \beta_M}{\partial \gamma} = -\sigma_P \frac{\partial \beta_P}{\partial \gamma} = -\frac{\eta\,\sigma_P}{[(1-\gamma)\,2\,\eta\,\phi_\alpha+\gamma]^2} < 0,$

(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 ER-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 electoral 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 of the tax-and-transfer policy allows also to investigate 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

$$\hat{G} = 1 - \sum_{i \in N'} n_i\,(Y_i + Y_j), \quad j = i - 1, \tag{4}$$

where N' is a rearrangement of N in the order of increasing after-tax incomes, Y_ℓ denotes the percentage of cumulative income up until group ℓ (with $Y_0 = 0$), and $j = i - 1$ refers to the group immediate before group i in terms of its income share (Fuller 1979).

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 indeterminate.

4 Empirical Evidence

The main purpose of this section is to assess empirically the equilibrium predictions derived above. To be more specific, we aim to test the following list of hypotheses, conveniently summarized in Table 1.

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)	-	+	+	+

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):

(2.A) rise (resp., decrease) with the percentage of independent voters among the poor;

(2.B) increase (resp., decrease) with voters' and parties' fairness concern;

(2.C) decrease (resp., increase) with power sharing disproportionality.

Hypothesis 3 The Gini coefficient associated with the distribution of after-tax disposable incomes:

(3.A) decreases with the percentage of independent voters among the poor;

(3.B) decreases with voters' and parties' fairness concern;

(3.C) rises with the disproportionality of the power sharing rule.

4.1 Data

The data employed to carry out the econometric tests is as follows.[20] To assess Hypothesis 3, the dependent variable is the most widely used measure of income inequality, namely, the Gini index, taken from Key Figures of LIS, which provides the highest quality data. To examine Hypotheses 1 and 2, 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, and taking exchange rates and deflators from the Penn World Table (PWT) of Feenstra, Inklaar, and Timmer (2015).

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 broad measure, removing only social security contributions and income taxes. Second, we consider a narrow definition, given by public assistance transfers minus income taxes. Finally, third, we consider a moderate version of the transfers, 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. 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.

[20]For brevity, the control variables used in the regressions are described in the Online Appendix.

To test the hypotheses involving electoral rule disproportionality, we employ Taagepera's (1986) index, which 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. This 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 2 postulates. To construct the index, data on the total number of votes for each election and country is collected from IDEA.[21] 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 respectively, from Carey and Hix's (2011) data set).

The main explanatory variables in Hypotheses (2.B) and (3.B) are voters' and parties' concern with fairness. 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.[22] 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. 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. The results from the t-Student test suggest that fairness concern is higher for the poor group than for the middle class, with a t-statistic of 4.37 and a corresponding single-tail p-value of virtually 0. In addition, the middle class displays higher inequality concern than the rich, with a t-statistic of 8.64 and a virtually null p-value. Figure 1 provide further evidence

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

[22]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.

regarding the ordering of the fairness concern for the different income groups, aligned with the information coming from the t-tests.

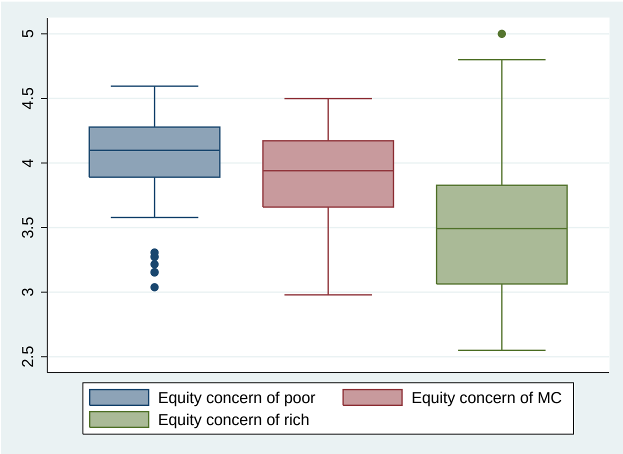

Figure 1: Fairness concern per income group

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

Finally, to assess Hypotheses (2.A) and (3.A), we construct a measure of voter ideological independence or neutrality within each income group. First, we elicit each respondent's ideological bias by looking at a question in the ESS questionnaire where the subject is asked to place itself on a left-right scale (an integer between 0 and 10), with the left taking a value of 0 and the right a value of 10. From each individual's left-right placement, noted by LR_i, we build its ideological neutrality, 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 resulting distributions 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

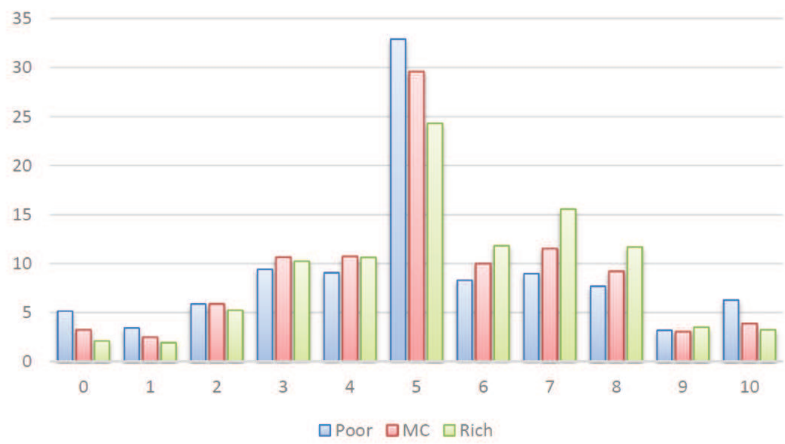

Figure 2: Distribution of ideological neutrality per income group

10 percent significance level) ideological independence than the other groups; and that the poor have higher independence than the rich, though the difference is not significant.

4.2 Empirical estimations

Regressing the group transfers using every parameter involved in the characterization of Section 3 severely restricts the number of observations available in our sample. Instead, we proceed by regressing in the first place the net transfers on the income gaps and the electoral rule disproportionality, subject to the GDP controls described below the tables and shown in the Online Appendix. This allows to work with 112 observations when we apply OLS, and with 114 observations when we apply country-specific fixed effects, accounting for non-observed time-invariant differences among the countries.

The results from these regressions, displayed in Table 2, suggest that there exists a positive and statistically significant association between each group's income gap and the net transfers that the group receives, offering empirical support to Hypothesis 1. This positive association is found using not only OLS, but also fixed effects. That is, it is present even when we ignore the between-country variability of the observed variables and we conduct the estimations exploiting only the within-country variability. Table 2 also suggests that higher electoral rule disproportionality is statistically associated with greater transfers to the middle-class and the rich, and with lower transfers to the poor (Hypothesis 2.C), though only the latter is robust to fixed effects estimations.

When considering our narrower definition of the transfers, the regressions offer further support to Hypothesis 1, as is shown in Table 3. However, the support to Hypothesis 2.C is relatively more limited. Indeed, not only the association between the group transfers and electoral rule disproportionality holds exclusively in the case of OLS, but also the disproportionality of the rule increases the transfers of the three groups. Having said that,

Table 2: Net transfers (full sample)

	Least Squares (OLS)			Fixed Effects (FE)		
	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

*: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$.
Standard errors are provided in parentheses.
R^2 is adjusted-R^2 for least squares; and within-R^2 for fixed effects.
Mean values are controlled for but estimates are not reported.
OLS regressions include a dummy identifying countries with p.c. income between 15 and 20 thous. 2005-USD; and a dummy identifying countries with p.c. income above 20 thous. 2005-USD. FE regressions include a set of country-specific dummies (see the Online Appendix).

note that the increase in the net transfers to the poor is significantly lower. Thus, as our theory predicts, a rise of electoral rule disproportionality do appear to be associated with a greater gap between the after-tax incomes of the non-poor and the poor group.

Next, we examine our hypotheses leaving aside party fairness concern, which constitutes the main restriction to the sample size. Table 4 confirms again the positive and significant link between (i) the net transfers and the income gaps, and (ii) the net transfers to the middle-class and the rich and electoral rule disproportionality. In contrast with Hypothesis 2.A, we do not find in Table 4 that the ideological neutrality of the poor is associated with greater transfers to the group; and although it is associated with lower transfers to the non-poor, this is not statistically significant. Hypothesis 2.B is not fully validated either, since increases in voters' fairness concern, holding their pre-transfer income constant, significantly rises the net transfers to all groups.

Finally, we regress the group transfers against the electoral rule disproportionality, the concern with fairness of the political parties, and the GDP per capita dummy controls. We find additional evidence in favour of confirming Hypothesis 1 and 2.C; and consistently with Hypothesis 2.B, it also transpires from Table 4 that party fairness is positively (resp., negatively) associated with the transfers to the poor (resp., non-poor), though statistical significance proves to be elusive in both cases.

Turning to the impact on after-tax income inequality, subject to the controls described

Table 3: Net transfers (narrow definition & full sample)

	Least Squares (OLS)			Fixed Effects (FE)		
	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

*: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$.
Standard errors are provided in parentheses.
R^2 is adjusted-R^2 for least squares; and within-R^2 for fixed effects.
Mean values are controlled for but estimates are not reported.
OLS regressions include a dummy identifying countries with p.c. income between 15 and 20 thous. 2005-USD; and a dummy identifying countries with p.c. income above 20 thous. 2005-USD. FE regressions include a set of country-specific dummies (see the Online Appendix).

in the Online Appendix, the evidence offers support for Hypothesis 3.C, suggesting a positive and significant association between the Gini coefficient and power sharing disproportionality, using both OLS and fixed effects, and on a sample of 171 country-year observations. These results are displayed in columns (1) and (2) of Table 5.[23] The results from the fixed effects column indicate that if a country were to increase its degree of disproportionality, as captured by the Taagepera index, by 0.1 units, it would face other things equal an increase in the Gini of around 2.6 points. The OLS results, while not accounting for other countries' unobservable factors that might affect post-tax income inequality, allow to compare the effects across different countries, and they suggest that the effect of power sharing on the Gini, while significant, is smaller, with a sensitivity of 0.3 points in the Gini for each 0.1 point of increase in the Taagepera index.

As with the transfers, regressing the Gini on all the parameters of the model is not possible due to the resulting limited number of observations. However, ignoring party fairness concern and using a restricted set of controls consistent with the low number of observations, the regression in column (3) of Table 5 confirms the positive and significant link between income inequality and electoral rule disproportionality. Interestingly, this regression does not offer support to Hypotheses 3.A and 3.B, that is, to a negative relation between the after-tax Gini index and (i) the percentage of ideologically independent voters

[23] As in the other cases, the tables showing the full list of controls are available in the Online Appendix.

Table 4: 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

*: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$.
Standard errors are provided in parentheses.
R^2 is adjusted-R^2.
Mean values are controlled for but estimates are not reported.
Regressions include a dummy identifying countries with p.c. income between 15 and 20 thous. 2005-USD; and a dummy identifying countries with p.c. income above 20 thous. 2005-USD (see the Online Appendix).

among the poor, and (ii) the concern of the electorate with fairness.

Finally, regressing the Gini against electoral rule disproportionality, parties' fairness concern, and the full set of controls, leads to the results displayed in column (4) of Table 5, which confirm Hypothesis 3.C. Moreover, they provide some validation to Hypothesis 3.B, in the sense that the Gini is negatively and significantly related to party fairness. As can be seen from the bottom row of the Table, the variation in the Gini is fairly well explained, as is captured by the R^2 coefficient. In addition, the F-statistics (not tabulated) indicate that these models cannot be rejected on any conventional significance level.

While the empirical results discussed above are quite satisfactory (especially, with regard to Hypotheses 1, 2.C, and 3.C), it is important to notice that data in our case are

Table 5: Gini coefficient

	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

*: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$.
Standard errors are provided in parentheses.
R^2 is adjusted-R^2 for least squares; and within-R^2 for fixed effects.
Mean values are controlled for but estimates are not reported.
Regressions in columns 1, 3 and 4 control for real GDP p.c. and its square, percentage of the population with completed secondary school, index and age of democracy, trade openness, population size, and population shares between 15 and 64 and over 65. Regression in column 2 controls for real GDP p.c., completed secondary school, trade openness, and population structure (see Online Appendix for further details).

grouped into clusters of countries. Hence, if regression errors are correlated within these clusters, default standard errors for the estimated coefficients will typically overstate the precision of the estimators. This might lead to over-accept the hypotheses under analysis. The model errors would tend to be correlated within countries (even when accounting for fixed effects) if, for example, we were to omit a relevant regressor. While it is not evident that we have omitted such a regressor, we would like to check if our empirical analysis is robust to the presence of within-cluster correlated errors.

To do that, we rely on a method proposed recently by Cameron and Miller (2015). That consists in estimating first the regression model with no control for within-cluster error correlation; and then post-estimation obtaining "cluster-robust" standard errors, which allow for correlated and heteroscedastic errors.[24] Overall, the regression results

[24]Given the relatively small number of clusters that we have, we follow the authors' suggestion and we use t-Student critical values to base our inferences.

with cluster-robust residuals confirm the previous findings.[25] In particular, the analysis suggests that the possible existence of clustered errors does not affect the validation of Hypotheses 1 and 2.C. With respect to Hypothesis 3.C, it gets confirmed under OLS, but not under fixed effects. This is obviously not surprising, given the relatively low variability of the Taagepera index within each country. Finally, in line with the results already discussed, controlling for cluster-robust residuals offers little or none support to the hypotheses regarding the effects of fairness and the ideological neutrality of the poor.

5 Discussion

In this paper, we have reexamined the problem of income redistribution in a model of political competition with power sharing and fairness. We have characterized the equilibrium net transfers to the income groups and shown that they consist of two parts, called altruistic and electoral redistribution. We have also shown how these transfers vary with their main determinants, that is, with the gap between the population and the group average pre-tax incomes, the ideological neutrality gap of the poor, electoral rule disproportionality, and parties' and voters' concern with inequality. In particular, the theoretical and the empirical results suggest that the net transfers to the more responsive group of voters (i.e., the middle class) and the after-tax Gini index both rise as policymaking power gets more concentrated in the majority winning party.

These results add to the literature on "targeted spending" (Cox and McCubbins 1986, Lindbeck and Weibull 1987, Dixit and Londregan 1995 and 1996), which has been used in the study of the size and the scope of public spending, social security, regional transfers, etc. (Persson and Tabellini 2000). Our work contributes in two fronts. The theory fills a gap in the current models by analysing electoral redistribution under a large variety of power sharing arrangements and in the presence of social preferences. The empirical part adds to the previous work by looking at income redistribution among different socio-economic groups, instead of focusing on inter-governmental transfers to sub-national regions (provinces, counties, etc.), as much of the literature does.

Additionally, our empirical approach differs from other papers in that we employ survey data to construct direct measures of voters' and parties' characteristics, instead of using exit polling data or data from past elections to approximate the proportion of swing voters in different geographical districts (Arulampalam, Dasgupta, Dhillon and Dutta 2009, Cox 2010, Larcinese, Snyder and Testa 2013). This strategy is problematic because voting behaviour is endogenous by assumption to electoral targeted spending, and it can therefore lead to biased estimates. We expect the endogeneity bias to be less

[25] Results controlling for cluster-robust residuals are displayed in the Online Appendix.

significant in our case because the correlation of survey data with voting behaviour in recent elections isn't expected to be high.

Our research also contributes to the literature on redistribution and other-regarding preferences. Within Meltzer and Richard's (1981) model of redistributive politics, preferences for redistribution that goes beyond those motivated by the agents' own economic benefit have been studied in Galasso (2003), Alesina and Angeletos (2005a,b), Tyran and Sausgruber (2006), Dhami and al-Nowaihi (2010a,b), Luttens and Valfort (2012), and Flamand (2012). 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). The latter analyzes a dynamic extension of the Lindbeck-Weibull model with a winner-take-all election at the end of each period. The aim of the paper is to show how different perceptions of fairness of the market outcomes can lead to different steady states of redistribution and growth. Our paper complements Alesina et al. (2012) by analyzing theoretically and empirically the consequences of different distributions of policymaking power over the redistributive policies and income inequality. By being dynamic, Alesina et al.'s (2012) framework isn't appropriate for that goal due to the lack of an accepted theory in political economy about how political power sharing evolves over time.

Finally, our work also adds to the literature on redistribution and inequality under different electoral rules (namely, firs-past-the-post (FPTP) and proportional representation (PR)). A central prediction is that PR favors spending on goods that benefit broad social groups, whereas FPTP favors spending on goods provided to specific subsets of voters (Persson and Tabellini 1999; Lizzeri and Persico 2001; Milesi-Ferretti et al. 2002; and Funk and Gathmann 2013). To our knowledge, this paper constitutes the first attempt to bring this insight into a framework with a rich variety of *mixed* electoral systems, which not only reflects better the reality of many democracies, but it also allows to quantify the effects of small changes in these rules over both redistribution and the Gini.[26]

A Appendix

Proof of Proporsition 1 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, namely,

$$\begin{aligned} &\max_{\mathbf{x}^C} \ \Pi^C(\mathbf{x}^A, \mathbf{x}^B) \\ \text{s.t.} \quad &\sum_{i \in N} n_i x_i^C = 0, \end{aligned} \tag{5}$$

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

$$x_i^C + e_i \geq 0 \text{ for all } i \in N, \tag{6}$$

$$e_R + x_R^C \geq e_M + x_M^C, \tag{7}$$

$$e_M + x_M^C \geq e_P + x_P^C, \tag{8}$$

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

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 (5)-(8). Consider first the case where $\lambda > 0$, $\mu_i = 0$ for all $i \in N$, $\delta_1 > 0$, and $\delta_2 = 0$. Under this configuration of values of the Lagrange multipliers, the system of first-order conditions reduces to (6) and (8) together with the following equations:

$$\frac{\partial \Pi^A}{\partial x_R^A} - \lambda n_R + \delta_1 = 0, \tag{9}$$

$$\frac{\partial \Pi^A}{\partial x_M^A} - \lambda n_M - \delta_1 = 0, \tag{10}$$

$$\frac{\partial \Pi^A}{\partial x_P^A} - \lambda n_P = 0, \tag{11}$$

$$\sum_{i \in N} n_i \, x_i^A = 0, \tag{12}$$

$$e_R + x_R^A - e_M - x_M^A = 0. \tag{13}$$

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

$$\frac{\partial \Pi^A(\mathbf{x}^A, \mathbf{x}^B)}{\partial x_i^A} = (1-\gamma)\,\eta\,\frac{\partial v^A(\mathbf{x}^A, \mathbf{x}^B)}{\partial x_i^A} - \gamma\, n_i\,(\tilde{e}_i + x_i^A), \tag{14}$$

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 (9) and (10), 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 (14) that

$$\lambda = \frac{n_M}{n_M + n_R}[(1-\gamma)\eta\phi_M - (\tilde{e}_M + x_M^A)D] + \frac{n_R}{n_M + n_R}[(1-\gamma)\eta\phi_R - (\tilde{e}_R + x_R^A)D], \tag{15}$$

where $D = (1-\gamma)\eta 2\phi_\alpha + \gamma$. Notice that from (11) and (14), it also follows that

$$\lambda = (1-\gamma)\eta\phi_P - (\tilde{e}_P + x_P^A)D. \tag{16}$$

Combining (15) and (16) together with (13),

$$x_P^A = \frac{(1-\gamma)\eta}{D} \frac{\phi_P - \phi}{n_R + n_M} + e_M + x_M^A - e_P. \tag{17}$$

Substituting (13) and (17) into (12), 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 (13) and (17), respectively. Moreover, using (16), 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 (6) and (8). 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 (5)-(8). 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 $d_i = (1-\gamma)\,\eta\, n_i\, f_i(0) + \gamma\,\frac{n_i}{2\sum_{i\in\mathcal{N}} n_i\alpha_i}$. ∎

Table 6: Number of observations and years by country in full sample regressions

Country	Transfers	Gini	Years
Australia	8	8	1981 1985 1989 1995 2001 2003 2008 2010
Austria	1	6	1987(G) 1994(G) 1995(G) 1997(G) 2000(G) 2004
Belgium	0	6	1985(G) 1988(G) 1992(G) 1995(G) 1997(G) 2000(G)
Canada	12	12	1971 1975 1981 1987 1991 1994 1997 1998 2000 2004 2007 2010
Czech Republic	5	5	1996 2002 2004 2007 2010
Denmark	7	7	1987 1992 1995 2000 2004 2007 2010
Estonia	0	4	2000(G) 2004(G) 2007(G) 2010(G)
Finland	3	7	1987(G) 1991(G) 1995(G) 2000(G) 2004 2007 2010
France	2	7	1978(G) 1984(G) 1989(G) 1994(G) 2000(G) 2005 2010
Germany	4	5	1994(G) 2000 2004 2007 2010
West Germany	4	6	1973(G) 1978(G) 1981 1983 1984 1989
Greece	3	5	1995(G) 2000(G) 2004 2007 2010
Hungary	0	6	1991(G) 1994(G) 1999(G) 2005(G) 2007(G) 2009(G)
Ireland	4	8	1987 1994(G) 1995(G) 1996(G) 2000(G) 2004 2007 2010
Israel	2	0	1992(T) 2001(T)
Italy	3	11	1986(G) 1987(G) 1989(G) 1991(G) 1993(G) 1995(G) 1998(G) 2000(G) 2004 2008 2010
Japan	1	1	2008
Netherlands	4	8	1983(G) 1987(G) 1990(G) 1993(G) 1999 2004 2007 2010
Norway	8	8	1979 1986 1991 1995 2000 2004 2007 2010
Poland	5	6	1992(G) 1995 1999 2004 2007 2010
Romania	0	1	1997(G)
Slovakia	1	4	1996(G) 2004(G) 2007(G) 2010
Spain	3	8	1980(G) 1985(G) 1990(G) 1995(G) 2000(G) 2004 2007 2010
Sweden	8	7	1967(T) 1975 1981 1987 1992 1995 2000 2005
Switzerland	5	5	1982 1992 2000 2002 2004
United Kingdom	11	10	1969(T) 1974 1979 1986 1991 1994 1995 1999 2004 2007 2010
United States	10	10	1974 1979 1986 1991 1994 1997 2000 2004 2007 2010
Total No Observations	114	171	

T (G) means that data is present only for the Net Transfers (the Gini).

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