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Voting, Inequality, and Redistribution

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# Voting, Inequality, and Redistribution

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## **Abstract**

This paper surveys models of voting on redistribution. Under reasonable assumptions, the baseline model produces an equilibrium with the extent of redistributive taxation chosen by the median income earner; if the median is poorer than average, redistribution is from rich to poor. Increasing inequality increases redistribution. However, under different assumptions about the economic environment, redistribution may not be simply rich to poor, and inequality need not increase redistribution. Several lines of argument are presented, in particular, political participation, public provision of private goods, public pensions, and tax avoidance or evasion. *JEL classification*: D72, O15. *Keywords*: inequality, redistribution, voting.

## 1. Introduction

The public sector provides goods and services and redistributes income. Arguably, even the provision of publicly supplied goods redistributes between individuals, since most of these goods and services are not financed by user fees or benefit taxes. Hence, understanding public redistribution is of great importance to public economics. There are basically two strands of the literature. One is the normative question of how much the state should redistribute to achieve certain goals of efficiency or equity (Boadway and Keen, 2000). The other is the determination of redistribution through the political process.

This paper will selectively survey some political economic models of redistribution. It will focus on a narrow class of models in order to describe how the literature has dealt with two basic questions: first, does redistribution through the political process reduce inequality, i.e., is it from rich to poor, and second, does increasing inequality increase redistribution? In so doing, the survey will focus on a narrow part of the literature. In particular, I concentrate on voting models. Moreover, since the relation between inequality and redistribution considered here is broad, I will look at ‘general’ transfers (i.e., the ‘social welfare state’) and disregard more narrowly targeted transfers as typically analysed in special interest models.<sup>1</sup> The survey will be centered on the ‘Romer-Roberts-Meltzer-Richard model’ (the ‘RRMR’ model for short) and describe various of its descendents and how they have modified the basic conclusions of this model.

The paper first discusses the general political economy of redistribution in the next section. Here, the RRMR model is embedded in the larger literature on the political economy of redistribution. The RRMR model is then reviewed in section 3. It also forms the basis of the extensions presented in the following sections. The RRMR model assumes that individuals differ with respect to their productivity which determines their income. It predicts that redistributive taxation is determined by the median income earner, with higher income individuals preferring less and lower income earners more taxation. It also predicts that if the ratio of median to mean income falls, redistribution increases. The evidence on this hypothesis is mixed, as the brief review in Section 4 will show. This gives a starting point for looking for alternative models. The aim of the paper is to review newer theoretical voting models which give predictions that are at variance with those of the RRMR model.<sup>2</sup> These predictions should also be a guide for future empirical work: if these

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<sup>1</sup>See, e.g., Persson and Tabellini (2000) for a survey of these issues.

<sup>2</sup>See also the survey by Harms and Zink (2003). They focus on limits to redistribution, whereas one

models have any practical relevance, they may explain why testing the RRMR model has proved so difficult. The paper will review those models that rely within the basic RRMR approach, but modify the economic environment in ways which change the predictions of the RRMR model. Hence, interest group models and bureaucracy theoretic approaches will be deliberately disregarded, even though they are surely empirically important.

The rest of the paper will be organised by categories which differ according to their redistributive consequences (and also, as will be pointed out as I go along, to the link between inequality and spending). In Section 5, the RRMR model is extended without affecting the basic conclusion that redistribution is rich to poor and higher inequality increases spending. However, there are different reasons why social spending might be limited. Two arguments reviewed are the effect of political participation and upward mobility. However, I also briefly look at social preferences, which under specific assumptions lead to more redistribution than predicted by assuming narrowly defined self interest on the part of voters.

Section 6 then turns the conclusions of the RRMR model on its head. In particular, here the emphasis is on spending which redistributes from poor to rich. Education is an oft-cited example. Another example discussed here is insurance.

Section 7 and 8 then turn to so-called ‘ends against the middle’ results. Section 7 starts with those models, popularised by Epple and Romano (1996b,a), which yield what Stigler (1970) has called ‘Director’s law’ of income redistribution: redistribution from the rich and poor to the middle class. Here I discuss public provision of private goods and public pensions. In section 8, ends against the middle equilibria emerge as well, but this time in the opposite direction: from the middle class to the rich and poor. Instances of this are again public pensions and tax evasion and avoidance. Finally, the last section offers some concluding comments.

## **2. The political economy of redistribution**

The political economy literature on redistribution is large, too large to be reviewed here. Instead, I will try to embed the voting models described below in the larger political economy literature. The main theme is that different groups of individuals can use the political machinery to redistribute resources towards themselves or their supporters. These groups

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theme in the present paper is also that redistribution may not be simply rich to poor.

may include interest groups and politicians or parties. This section will be necessarily brief and incomplete, but the purpose here is not to be comprehensive, but rather to shed light on the way different political actors or institutions shape redistributive outcomes.

### *2.1. Parties*

Voting models assume that government policies are either directly determined by voters, or that policy outcomes of representative democracies are the same that would be implemented by direct voting. This would hold in a one-dimensional policy space if all voters have single peaked preferences and two parties compete for votes, where the parties are motivated solely by the desire of winning office.<sup>3</sup> However, if the parties are run by politicians with their own preferences on policies, then policy outcomes will generally depend on the party in office. In the extreme, when parties compete only once and cannot make binding commitments to voters, the implemented policy will correspond to the ideal policy of the party in office (Alesina, 1988).

In general, the ‘partisan theory’ of political competition assumes that left-wing parties represent lower income voters and right wing parties high income voters. Hence, if a leftist government is in power, it should opt for higher spending on items which redistribute to the poor.

There is some support for the partisan theory. For instance, using data for developed countries, Cusack (1997) finds higher spending with left wing governments, while Hicks and Swank (1992) find evidence of higher welfare spending when left-wing governments are in power. Snyder and Yackovlev (2000) find that spending on social protection in the US increases more rapidly when Democrats control the legislature or the Presidency. There are, however, also studies which do not find much support for partisan effects on redistributive spending.<sup>4</sup>

Bartels (2004) finds that in the US, Democratic presidents have produced slightly more income growth for poor families than for rich families, resulting in a modest decrease in overall inequality. Republican presidents have produced a great deal more income growth for rich families than for poor families, resulting in a substantial increase in inequality.

In sum, partisan models of redistribution predicts more redistribution to the poor than

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<sup>3</sup>See, e.g., Mueller (2003) and Persson and Tabellini (2000) for an overview of these models.

<sup>4</sup>See the references cited in Snyder and Yackovlev (2000).

voter models when left wing governments are in power and less when the right is in power.

There are various other party models which give different predictions. Roemer (1998) argues that redistribution is limited by party competition. In particular, if voters differ by income as well as ideology, leftist parties may propose limited redistribution in order to attract richer voters who share their ideology (called religion by Roemer).

## *2.2. Political system*

There is a growing literature on ‘comparative political economy’ which examines the effect of different political institutions on government outcomes, e.g., fiscal policy in general and redistribution in particular (see Persson and Tabellini, 2000, for an overview). These models predict that contrasted with majoritarian elections, systems of proportional representations have larger governments and a larger share of spending going to broad based welfare programs, whereas majoritarian elections lead to more narrowly targeted spending programs. The intuition is, roughly, that with proportional representation, legislators are elected in large districts, so to win they need support from a broad based majority, while in majoritarian elections, legislators need to win the majority of all districts, so spending will be tilted towards a more narrowly defined base in those districts. Likewise, parliamentary regimes should have larger welfare programmes than presidential regimes. Persson and Tabellini (2004) find indeed that welfare spending is significantly higher in countries with proportional representation than in those with winner-takes-all elections, but there is no strong support for the hypothesis of larger welfare spending in parliamentary than in presidential regimes.

## *2.3. Interest groups*

Since voters are not well informed on political issues, interest groups may tilt redistributive spending in their favour by exerting pressure, lobbying, or making campaign contributions to politicians. Recent papers model the interaction between voting and interest group activity (e.g., Dixit and Londregan, 1998; Persson and Tabellini, 2000). If politicians are purely office motivated, they will converge on identical policy proposals. However, transfers will not conform to the wishes of voters, but instead, groups with political clout will receive larger transfers. In particular, groups which are less motivated by ideology receive higher transfers. The implications for who benefits from redistribution are discussed below in



section 6.1.

### 3. The Romer-Roberts-Meltzer-Richard Model

Generically, equilibria in voting on redistribution may not exist. The simplest example to demonstrate this is that of the distribution of a fixed pie, among three individuals. Let  $x_i, i = 1, 2, 3, \sum_i x_i = 1$  be individual  $i$ 's share of the pie. The problem is two dimensional and nonexistence of a Condorcet winner is easily demonstrated (see, e.g., Mueller, 2003). Therefore, the literature has largely studied voting for some given sharing rule. In the RRMR model and the ensuing literature, the proceeds from a linear tax rate are used to finance equal per capita grants to all voters. The problem therefore becomes one-dimensional and sufficient conditions for existence can be derived.

In the model exposed in different versions by Romer (1975), Roberts (1977) and Meltzer and Richard (1981), there are individuals who are differentiated by their ability level, which is also their wage rate, denoted by  $\theta$ . The wage rate is distributed according to the distribution function  $F(\theta)$  with continuous density  $f(\theta)$ . Individuals have strictly quasiconcave utility functions defined over consumption,  $x$  and leisure,  $L$ ,  $u(x, 1-l)$ , where  $l$  is labor and the time endowment is normalized to one. Assume that  $u_x, u_L > 0, u_{xx}, u_{LL}$ , where subscripts denote partial derivatives. Further, assume that consumption is a normal good. There is a linear income tax on labor income, which is the only source of income. The proceeds of the tax are used to finance a per capita lump sum grant  $g$ . Normality of consumption implies that, while labour supply may rise or fall with the wage, gross income,  $y = \theta l$ , is increasing in  $\theta$ .

In pairwise votes over proposals in one dimensional issue space, an equilibrium can be shown to exist if preferences satisfy (a) single peakedness or (b) the single crossing property.<sup>5</sup> Since indirect utility is not necessarily concave in  $t$ , single peakedness does not necessarily hold.

However, single crossing does: Define  $\sigma := dg/dt|_{\bar{V}}$  as the slope of an individual indifference curve in  $(g, t)$  space for some utility level  $\bar{V}$ . Single crossing holds if any two individuals' indifference curves cross at most once. The indirect utility function is

$$v(\theta, t, g) := \max_l u((1-t)\theta l + g, 1-l). \quad (1)$$

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<sup>5</sup>See Mueller (2003) for a survey of voting models and Gans and Smart (1996) for an exposition of the single crossing approach.

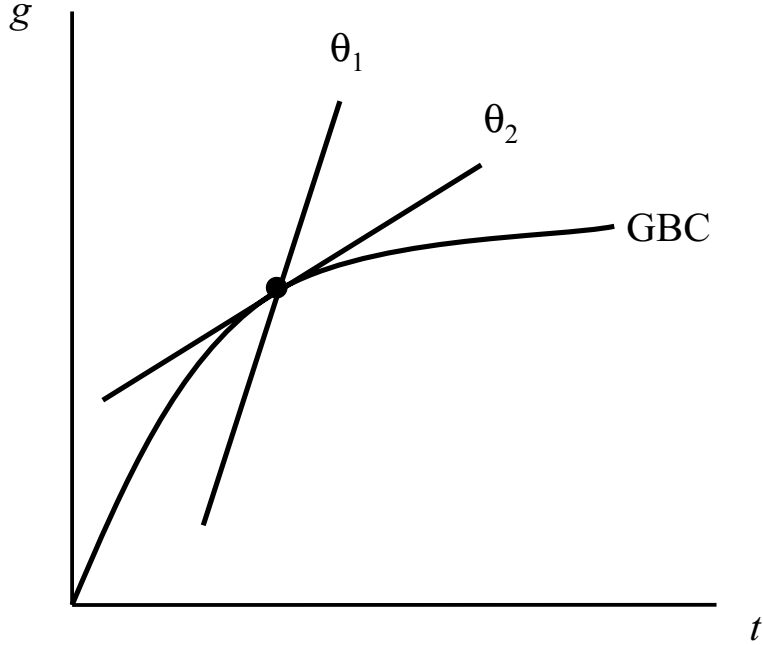


Figure 1: Voting equilibrium in the RRMR model.

Implicitly differentiating (1) therefore gives:

$$\sigma = -\frac{v_t}{v_g} = \theta l. \quad (2)$$

Since  $y$  is increasing in  $\theta$ , the indifference curves of two individuals can cross at most once, and, hence, the single crossing condition is fulfilled.

An implication is that a voting equilibrium exists which corresponds to the optimal tax rate and transfer of the voter with median ability (or, equivalently, median income),  $\theta_m$ , where  $F(\theta_m) = \frac{1}{2}$ . This is most easily demonstrated by considering Figure 1.<sup>6</sup>

Consider an individual's optimal tax rate and transfer. The individual solves

$$\max_{g,t} v(\theta, t, g) \text{ s.t. } g = t\bar{y},$$

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<sup>6</sup>The indifference curve are drawn linearly for convenience.

where  $\bar{y} = \int_{\theta} y dF(\theta)$ . An interior optimum for the voter with income  $y$  is therefore where the indifference curve is tangent to the budget constraint, or

$$y = \bar{y} + t\bar{y}_t. \quad (3)$$

The optimum tax rate for a voter with income  $y$  is then  $\max\{0, t(y)\}$ , where  $t(y) = (y - \bar{y})/y_t$ .

Now consider the optimum tax rate,  $t_m$ , of the median income earner,  $y_m$ . By the definition of  $y_m$  and the single crossing condition, half of the population have higher income than  $y_m$  and therefore steeper indifference curves; they prefer a tax rate lower than  $t_m$ . The other half have lower income and flatter indifference curves and prefer a higher tax rate. Therefore,  $t_m$  can not be beaten under pairwise votes.

From equation (3), it follows that the equilibrium tax rate depends on the ratio of median to mean income, which is a measure of the inequality of the income distribution. If inequality thus defined increases, redistributive taxation will increase.

The result can be extended to any class of tax schedules which can be ordered unambiguously by progressivity as defined by Lorenz dominance (Gans and Smart, 1996). Alesina and Rodrik (1994) and Persson and Tabellini (1994) further generalise the RRMR model to a dynamic setting and show that more inequality leads to lower growth through investment disincentives implied by higher capital taxes.

## 4. Empirical Evidence

The RRMR model predicts that there will be more redistribution the lower median income is relative to mean income (the higher is inequality). The evidence on this is, however, mixed. Bénabou (1996) cites ten studies of which nine did not find evidence consistent with the RRMR model.

Positive evidence is found, e.g., by Alesina and Rodrik (1994) and Persson and Tabellini (1994), but Perotti (1996) does not find evidence in support of the model. More recent evidence is also mixed. Milanovic (2000) uses what he calls the required data, in particular, cross country data of factor income distribution, and finds evidence in support of the RRMR model. Rodriguez (1999b) uses similar data for the US (which, presumably, are more easily comparable). He finds no evidence for the RRMR model.

There is some evidence that the size of government increases with an extension of the

franchise, as hypothesized by Meltzer and Richard (1981).<sup>7</sup> See, for instance, Husted and Kenny (1997), Lindert (1996), and Mueller and Stratmann (2002). Husted and Kenny (1997) estimate separate regressions for welfare and non-welfare spending. For publicly provided goods, demand rises with lower income only if the income elasticity of demand is lower (in absolute value) than the price elasticity, which appears not to be the case for most services. Consequently, Husted and Kenny (1997) find that extending the franchise increased welfare spending but had no effect on non-welfare spending.

Mayer (n.d.) attempts to estimate the effect of inequality on state spending in the US for different spending categories. She finds that increasing inequality (measured by the Gini coefficient) increases overall spending and spending on health care and secondary schooling while decreasing welfare benefits and spending on post-secondary schooling. This is an interesting strategy, since, as Mayer (n.d.) rightly mentions, voting models have different implications for the link between inequality and spending depending to the incidence of what revenues are spent on. Using a cross-country panel Moene and Wallerstein (2003) find that wage inequality (the ratio of the 90th to the 10th percentile) *reduces* spending on unemployment insurance, active labour market policies, and injury and disability insurance, whereas inequality is unrelated to spending on pensions and health insurance.

To summarise, the RRMR hypothesis of a link between inequality and the size of the government has met with mixed empirical evidence. The purpose of this paper is not to review this evidence in any detail and comment on possible improvements in empirical strategies or the importance of political institutions (Besley and Case, 2003). Rather, I will look at models that remain within the RRMR framework and attenuate or change its conclusions. As one point of departure, I will take the evidence that spending increases with growing inequality in *some* but not all spending categories. Hence, it makes sense to depart from the RRMR model in the modelling of the welfare state. Instead of assuming that spending on redistribution can be captured in one broad based measure of welfare transfers, it may make sense to consider different categories of spending. If the effect of inequality differs according to which category is considered, there is no reason to believe a priori that aggregate spending should increase with inequality.

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<sup>7</sup>Meltzer and Richard (1981) also note that their model cannot explain why the decisive voter would want to extend the franchise since this would make her worse off. Forces outside the model are needed, such as the desire to tame social unrest (Acemoglu and Robinson, 2000).

## 5. Rich to Poor (RRMR continued)

In this section, the basic conclusions of the RRMR model will be left intact. That is, I present models of redistribution from rich to poor with increasing inequality leading to more redistribution. However, these conclusions will be either attenuated or exacerbated. The section looks at political participation, social mobility, and social preferences.

### 5.1. Political Participation

Consider first the effect of political participation on the outcome of political processes. There is a large economic and political science literature which shows that higher income individuals are more likely to participate in the political process (Rosenstone and Hansen, 1993). The effect of this is studied by Bénabou (2000).<sup>8</sup>

Consider the model of section 3, with the modification that political participation is a function of income. In particular, single crossing holds so the median voter is decisive. Moreover, richer voters will, other things equal, prefer lower taxes than poorer ones. However, since not everyone votes, the decisive voter will be the voter with median income among those who vote, which may differ from the population median.<sup>9</sup> Specifically, following Bénabou (2000), assume that political weight is a function of income,  $\omega = f(y)$ . Furthermore, suppose income is lognormally distributed:  $\ln y \sim N(y_m, \sigma)$ . Bénabou (2000) shows that if  $\omega = y^\lambda$ , the decisive voter has log income  $\ln y^* = y_m + \lambda\sigma$ . Thus, if  $\lambda > 0$ , i.e., political participation increases with income, the pivotal voter has income above the median. As a result, redistribution is lower than it would be with full participation.

Bénabou uses the model to compute the percentile of the decisive voter in the income distribution, given data on the political participation of various population groups from Rosenstone and Hansen (1993).<sup>10</sup> For instance, the poorest 16 percent of the income distribution in the US account for 12.2 percent of the votes and four percent of campaign

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<sup>8</sup>Borck (2002) describes some of the implications of this on the optimal size of jurisdictions, the effect of decentralization on the size of government, and the measurement of congestion.

<sup>9</sup>Note that the precise prediction of the RRMR model is that the tax rate will depend on the ratio of the median income among *eligible voters* to the mean income of taxpayers. However, for reasons of practicality, empirical studies implicitly assume that the distributions of eligible voters, taxpayers and total population are identical.

<sup>10</sup>These computations assume that the political weight is a function not of absolute income, but of a voter's rank in the distribution.

contributors, while the richest five percent account for 6.4 percent of votes and 16.3 percent of contributors. By implication, if voting were the sole means of political influence, the pivotal voter would be at the 55.5th percentile, while if contributions were the only means of influence, it would be the 73.6th percentile. The distribution of political influence, therefore, is extremely skewed. Consequently, redistribution will be much lower than predicted by the RRMR model. Averaging over all political activities would imply a decisive voter with income at about the 65th percentile of the distribution. Since the mean is at the 63rd percentile, the prediction would be redistribution from *poor to rich*, since the decisive voter would have income above the mean.

Rodriguez (1999a) analyzes a model where the median voter is decisive, but redistribution is limited by the fact that rich capital owners expend more on campaign contributions, which causes politicians to grant them tax exemptions. These models have the implication that redistribution need not increase when inequality rises (Bénabou, 2000; Rodriguez, 1999a).

### 5.2. *Upward mobility*

? among others have argued that some poor individuals may oppose redistribution if they expect to be rich in the future and if redistribution policies are sufficiently stable. In their model, it turns out that voters oppose redistribution if future income is an increasing and concave function of today's income. Redistribution is limited by the stability of voting outcomes, the prospect of upward mobility, and the far-sightedness of voters. An implication of this model is that high initial inequality does not necessarily imply a lot of redistribution.

### 5.3. *Social Preferences*

The arguments presented so far all point to less redistribution or redistribution to different individuals in the income distribution than predicted by the RRMR model. But there are undoubtedly mechanisms which point in the other direction. The one I will point out here is social preferences. In brief, if individuals care not only about their own welfare but about the welfare of others as well, then redistribution may be higher than predicted by the RRMR model, other things being equal. Social preferences may take several forms, e.g., altruism, reciprocity, or inequality aversion (see Fehr and Schmidt, 2000 for a survey).

These models lead to different predictions than the RRMR model, not only concerning the extent of redistribution, but also concerning the link between inequality and redistribution (see Galasso, 2003). I will briefly outline the implications of assuming altruism or inequity aversion as motivation of individual taxpayer-voters.

Suppose for simplicity that an individual  $i$  has linear preferences over her own consumption,  $x_i$ . For expositional simplicity, let there be three classes, poor, middle and rich, with incomes  $y_P < y_M < \bar{y} < y_R$ . Let redistribution consist of a lump sum grant, as in the RRMR model, financed by a linear income tax with quadratic deadweight costs. Call the individual altruistic if we can write her preferences as

$$u_i = x_i + \gamma_j^i \sum_{j \neq i} x_j, \quad \text{for } j \neq i, \quad (4)$$

where  $\gamma_j^i$  is the extent of  $i$ 's altruism towards  $j$ . What are the model's predictions? Assuming that  $\gamma_j^i = \gamma_j$  for all  $i$ , the equilibrium tax rate will be that preferred by the median income voter. Is that tax rate going to be higher than it would be in the absence of altruism? The answer is less obvious than it seems. On the one hand, increasing altruism increases the equilibrium tax rate proportionately to the term  $\gamma_P(y_M - y_P)$ , other things equal, which comes from the altruistic benefit implied by redistributing to the poor. On the other hand, the altruistic cost of taxing the rich decreases the equilibrium tax rate proportionately to  $\gamma_R(y_M - y_R)$ . Which effect outweighs the other depends on altruistic preferences towards the rich and poor, and the distance between median and low incomes on the one hand and median and high incomes on the other.

Consider the effect in this model of a mean preserving spread of the distribution, in particular, suppose that  $dy_R = -dy_P > 0 = dy_M$ . It is easy to show that this will increase the median voter's optimal tax rate if and only if  $\gamma_P > \gamma_R$ , which would seem to be the reasonable assumption. Thus, rising inequality here would increase redistribution even if mean and median income stay constant.

Second, consider a model of inequality aversion (Fehr and Schmidt, 1999). Here individual  $i$ 's utility is of the form:

$$u_i = x_i - \frac{\alpha_i}{2} \sum_{j \neq i} (\max\{x_j - x_i, 0\}) - \frac{\beta_i}{2} \sum_{j \neq i} (\max\{x_i - x_j, 0\}), \quad (5)$$

where  $\alpha_i$  is the marginal disutility of disadvantageous inequality, and  $\beta_i < \alpha_i$  the marginal disutility of advantageous inequality. It is assumed that  $\alpha_i, \beta_i > 0$ ,  $\beta_i < 1$  and  $\beta_i < \alpha_i$  for

all  $i$ . In words, disadvantageous inequality hurts more than advantageous inequality. Also, since  $\beta < 1$ , individuals would not want to throw away money in order to prevent being better off than others.

Under the assumption that  $\alpha_i = \alpha$  and  $\beta_i = \beta$  for all  $i$ , the median income earner is again decisive. Obviously, inequality aversion (in the sense of a rise in either  $\alpha$  or  $\beta$  or both) increases redistribution in this model: first, the median voter dislikes being better off than the poor, which increases the motive to redistribute towards them, and second, the median voter dislikes – even more – being worse off than the rich, which converts the costs of taxing the rich into a benefit.<sup>11</sup> Hence, redistribution rises with inequality aversion.

A mean preserving spread also increases redistribution in this model: both the benefit of redistributing to the poor and the benefit of taxing the rich increase with the difference between median and poor or rich income.

To summarize, social preferences change the nature of the voting game in two directions. First, redistribution is likely to be higher than with strictly selfish individuals. This holds unambiguously with inequality aversion, and also with altruism if altruism towards the poor is sufficiently stronger than towards the rich. Second, social preferences imply that the extent of redistribution depends on the income distribution in ways which differ from the RRMR model. In particular, in the RRMR model, the income distribution affects redistribution only through the ratio of median to mean income. With social preferences, redistribution depends on the variance of the distribution even if median income is not affected.

## 6. Poor to rich

In this section, I consider some models where spending redistributes from poor to rich. This ‘perverse’ outcome will obtain if individual tax rates increase with income. The rich will then effectively subsidised by the poor. This may be the case, for instance, if for some reason the tax system is regressive. However, in this section I concentrate on the incidence of spending for proportional tax systems.

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<sup>11</sup>In fact, inequality aversion is isomorphic to altruism towards the poor and envy towards the rich.



### 6.1. Public good provision

Before turning to more specific examples, consider public provision of a private good financed by proportional income taxes.<sup>12</sup> The basic analysis from the RRMR model is easily amended to this case. Abstracting from labour supply, preferences are given by  $u(g, x)$ , where  $g$  is the publicly provided good. It will be assumed that  $g$  is a normal good. The indirect utility function can be written

$$v(\theta, t, g) := \max_t u(g, (1 - t)y). \quad (6)$$

As in section 3, the slope of an individual's indifference curve is found by differentiating (6):

$$\sigma = -\frac{v_t}{v_g} = \frac{yu_x}{u_g}. \quad (7)$$

Equation (7) shows that there are two opposing effects of increasing income on the preferences for spending. First, the tax price of  $g$  increases with  $y$ , leading to a lower preference for spending. Second, however, since  $g$  is a normal good, richer voters have higher demands, other things equal, so spending would tend to increase with  $y$ . It can be shown that the net effect of income on preferred spending is positive if the income elasticity of demand exceeds the price elasticity (Kenny, 1978).

### 6.2. Education

Education is an example where it is often alleged that the upper classes benefit disproportionately from public spending. Public financing of education may then redistribute to the middle and high income classes.

Fernandez and Rogerson (1995) study voting on education subsidies. A linear income tax is used to provide subsidies to individuals who acquire an education, and these individuals are assumed to be credit constrained. Thus, even with subsidies, poorer individuals may not be able to acquire education. Fernandez and Rogerson (1995) show that a voting equilibrium can exist where subsidies go to the rich and middle class only, with the poor paying taxes and not obtaining an education. This formalises the intuition that public education financing may effectively subsidize well-to-do classes. There is also evidence which supports this fact: children from richer families are more likely to obtain higher education,

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<sup>12</sup>Public goods can be treated in exactly the same manner.

so subsidies to higher education effectively involve a transfer to those classes.<sup>13</sup>

### 6.3. Insurance

The RRMR model can also be extended to allow for insurance aspects. This extension is not trivial since part of the welfare state redistributes between individuals ex post, but from an ex ante perspective, welfare spending may provide insurance to individuals. It is also apparent that individual risk perceptions now impact the voting outcome. Moene and Wallerstein (2003) propose the following model. Suppose individuals differ by their wage,  $w$ , but all face the same probability,  $1 - \pi$ , of income loss due to illness or unemployment. Wages are distributed according to a log-normal distribution function. Individuals are risk averse and have a von-Neumann-Morgenstern utility function

$$\pi u(c_E) + (1 - \pi)u(c_N),$$

where  $u' > 0 > u''$ , and  $c_E(c_N)$  is the consumption in the ‘good’ (‘bad’) state. The welfare state can provide a general transfer to all individuals, whether or not they are employed (e.g., health care), or an unemployment benefit to those with no income only.<sup>14</sup> Expenditures are financed by a proportional wage tax at rate  $t$ .

Moene and Wallerstein (2003) show the following: If the constant coefficient of relative risk aversion exceeds 1 (implying that the demand for unemployment insurance rises with income), the level of unemployment benefits declines with increasing wage inequality. The reason is that the median voter (whose income falls with rising inequality) now demands less insurance, and, since the coefficient of relative risk aversion exceeds 1, this income effect outweighs the price effect whereby benefits are obtainable at a lower price since the median voter’s income and therefore her tax share have fallen.<sup>15</sup>

In the case of universal benefits received regardless of income loss, the benefit level increases with rising inequality if the coefficient of relative risk aversion is close to one and decreases when it is sufficiently large. The intuition here is that this sort of programme

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<sup>13</sup>See the studies cited in Fernandez and Rogerson (1995) for evidence on this point.

<sup>14</sup>They also examine the case where benefits are paid to the employed only, which conceptually corresponds to the RRMR model.

<sup>15</sup>The reasoning here differs somewhat from the standard microeconomic models of insurance demand: there, the demand for insurance falls with income if absolute risk aversion decreases with income. The premium in those models is independent of income and paid in both states of the world. Here, the ‘premium’ is paid in the form of taxes only in the good state and is related to individual income.

combines redistribution and insurance aspects. When the median voter's income falls, she will demand less insurance and more redistribution, where the first effect will dominate if relative risk aversion is sufficiently large.

## 7. Ends against the middle I: Director's law

### 7.1. *Public Provision of Private Goods*

Consider, again, voting on the level of a publicly provided private good such as education, safety, or health care.<sup>16</sup> In contrast to section 6.1, however, suppose that public provision can be supplemented or substituted by private supply. Epple and Romano (1996a) and Gouveia (1997) model public provision of private goods when households may supplement public provision by private purchases. Health services may be a good example. Public provision is financed by an income tax. Epple and Romano (1996a) show that an equilibrium exists with public provision and private supplementary purchases. If the marginal willingness to pay for health services decreases with income, the median income earner is decisive.

If, as seems more likely, the marginal willingness to pay rises with income, the decisive voter has income below the median.<sup>17</sup> The intuition is the following: Very rich voters prefer zero public spending because private market purchases are cheaper for them than government provision. For all others, the optimal level of publicly provided health care increases with income. The decisive voter then must have below median income: the coalition for lower expenditures is made up of low income voters and those high income voters who prefer zero public spending. This equilibrium is dubbed 'ends against the middle', since the equilibrium spending level redistributes from the ends of the distribution to the middle.

When public provision cannot be supplemented Stiglitz (1974) showed that preferences are not single peaked and hence, an equilibrium does not necessarily exist. The reason

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<sup>16</sup>Voting may also be over provision of public goods. For an analysis that derives equilibrium with public and private provision of public goods, see Epple and Romano (2003).

<sup>17</sup>Note that single crossing is violated in this case: where individuals use the private alternative,  $\sigma$  is increasing in  $\theta$ , while it is decreasing where there is no supplementation. However, Epple and Romano (1996a) assume income to be exogenous. In this case, utility can be shown to be single peaked so that a Condorcet winner exists.

is that an individual will choose private education when public spending is below that level which makes him just indifferent between public and private schools. In this region, therefore, utility decreases with public spending. Above that level, however, at least for some individuals, utility will first rise with increased spending, so that preferences are not single peaked and an equilibrium may fail to exist.

Epple and Romano (1996b) also study public provision with private substitutes. Consider the same notation as in section 6.1. Let  $g_p$  denote an individual's optimal level of private education, which solves

$$\max_g u(g, (1-t)y - pg),$$

where  $p$  is the price of private education. The indifference curves in  $(g, t)$  space now have two parts, depending on whether private or public education is chosen:

$$\sigma = \begin{cases} \infty & \text{if } g < \tilde{g}(y) \\ y \frac{u_x}{u_g} & \text{if } g \geq \tilde{g}(y) \end{cases} \quad (8)$$

where  $\tilde{g}(y)$  is the level of spending where an individual with income  $y$  is just indifferent between public and private school. When private education is chosen, indifference curves are vertical since the individual does not benefit from public spending but has to pay taxes. In the region where public education is chosen, the slope of the indifference curve decreases with  $y$  under the assumption that the income elasticity of demand exceeds the price elasticity. In this case, since  $\tilde{g}(y)$  increases in  $y$ , it can be shown that single crossing fails and an equilibrium may fail to exist.<sup>18</sup> When an equilibrium does exist in this case, Epple and Romano (1996b) show that either the median income earner is decisive, or an ends against the middle equilibrium results as just described: the coalition for lower spending than desired by the decisive voters consists of poor voters with low preferred education levels and rich voters with high preferred education levels who, however, choose private schools. The implications are thus similar to those of the previous model.

A similar conclusion is also reached, albeit in a representative democracy model, by Dixit and Londregan (1998). They use a two-party probabilistic voting model to analyse redistributive politics. Politicians cater to voters who have both ideological and economic

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<sup>18</sup>In the reverse case, where the income elasticity is less than the price elasticity, single crossing holds and an equilibrium exists which has the basic properties of the RRMR model: richer individuals have lower preferred levels of public education.

incentives. In equilibrium, the net transfers received by socioeconomic groups depends on their ideological attachment to one of the parties. Dixit and Londregan (1998) argue that poor voters may be attached to left wing parties and rich voters relatively attached to the right, while the middle class show no strong loyalty. Therefore, in equilibrium, the middle class receive large transfers because they are perceived by the parties as swing voters.<sup>19</sup>

## 7.2. *Public Pensions*

Consider now public pension systems. The system is assumed to be of the pay-as-you-go type, that is, benefits to current pensioners are financed by the current working population. This implies an intergenerational redistribution from current workers to pensioners, which has led several writers to infer that the social insurance budget is too large in a democracy: the old and those near retirement do not internalize the full costs of the pension system and therefore vote for an expansion beyond the efficient size (Browning, 1975).

However, there may also be an intragenerational distribution. Under Bismarckian systems, benefits are tied to contributions, so there is little redistribution within generations. This is different, however, under Beveridgean systems where this link is weak. Such a system is studied by Persson and Tabellini (2000), who consider an economy made up of three generations, young, old and middle aged.<sup>20</sup> Each generation lives for three periods, works when young and middle aged, and receives pension benefits when old. The contribution rate is a flat rate on income: a worker with income  $y$  pays  $\tau y$  into the pension system. The system is Beveridgean, however, in that the pension benefit per retiree is  $(1+n)\tau\bar{y}$ , where  $n$  is population growth and  $\bar{y}$  average income.

The implication is that there is intragenerational redistribution. Interests are thus lined up along two dimensions: age and income. The preferred pension level is higher the older and poorer the individual. Persson and Tabellini (2000) show that in equilibrium, there is a pair of decisive voters, one young and one middle aged, where the young decisive voter has lower income than the middle aged one.<sup>21</sup>

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<sup>19</sup>There is, however, also a sense in which the poor are generally favoured in redistributive models using probabilistic voting: since utility is concave in income, the poor respond strongly to transfers and would therefore, other things equal, receive higher transfers in equilibrium. This motive may, however, be countered by the political clout of particular groups.

<sup>20</sup>See also Tabellini (2000).

<sup>21</sup>It is assumed that population growth is high enough to ensure that pensioners are not in the majority.

Casamatta et al. (2000) present a model with two generations: workers and pensioners. In contrast to Persson and Tabellini (2000), however, they find that under certain assumptions, optimal tax rates are increasing in income for workers up to some income level,  $\tilde{y}$ , above which the optimal tax rate is zero (this is because for those with higher income, the implicit rate of return of the PAYGO system becomes negative). The reason is that the elasticity of intertemporal substitution is assumed to be low, which implies that high income workers want to transfer a larger share of their income towards the future, since their rate of return under the PAYGO system is lower. If less than half the population prefer zero taxes, the equilibrium tax rate is that preferred by a voter with income below the median, such that middle income voters prefer high taxes and poor and rich voters prefer low taxes. This is similar to the “ends against the middle” result of Epple and Romano (1996a,b) mentioned above.<sup>22</sup>

## 8. Ends against the middle II

### 8.1. Pensions again

In Casamatta et al. (2000), optimal contribution rates first rise with income and then suddenly fall to zero when individual income is high enough. More likely, one would think of optimal tax rates rising or falling continuously with income. The insight that richer individuals may, over some range, benefit more from public pensions than poorer ones is, however, an interesting one. Borck (2003a) considers a model similar to Casamatta et al. (2000), with the additional assumption that life expectancy is an increasing function of income. This is a well documented fact.<sup>23</sup> The implication is that even under a Beveridgean system, richer individuals may benefit more from pension systems if their longer life expectancy more than outweighs the higher per period contribution (that is, if the income elasticity of life expectancy exceeds one). This holds even though the assumption on preferences guarantees that with homogeneous life expectancy, optimal pension levels would decrease with income as in Persson and Tabellini (2000). Under a pure Bismarckian system, the optimal contribution rate increases with income if life expectancy increases

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<sup>22</sup>When the intertemporal rate of substitution is high, optimal tax rates decrease with income and the coalition of high tax voters consists of pensioners and poor workers.

<sup>23</sup>See, e.g., Deaton and Paxson (1999) for the US, Attanasio and Emerson (2001) for the UK and Reil-Held (2000) for Germany.

with income. The equilibrium tax rate is then that preferred by a low income worker, with pensioners and high income workers voting for high taxes. Under a Beveridgean system, optimal contribution rates increase with income if the income elasticity of life expectancy exceeds one. If the optimal tax rate is a U-shaped function of income, the equilibrium tax rate is that preferred by a pair of voters. In that case, middle income voters prefer low taxes while poor and rich voters prefer high taxes, resulting again in an ends against the middle redistribution. However, redistribution here is from the middle class to the rich and poor; Director's law is, so to speak, stood on its head.

## 8.2. *Tax Evasion and Avoidance*

It is well known that tax evasion or avoidance affect the redistributive nature of taxation. With evasion or avoidance, individuals pay their taxes on declared income, which may differ significantly from true income. If avoidance increases with income, the tax system will be less redistributive than if everyone reported truthfully. Again, this has implications for the nature of the voting equilibrium (Borck, 2003b; Roine, 2003).

Borck (2003b) shows that voting on redistribution with tax evasion changes the analysis from the RRMR model. In the model, individuals are risk neutral and face a penalty for evasion made up of a fixed penalty and a constant surcharge on the evaded tax. Risk neutrality implies that a voter will evade either all or none of his taxes.<sup>24</sup> Hence, for each voter, there is a unique tax rate where that voter starts evading his entire income, and this tax rate falls with rising income. Expected tax revenue finances a lump sum grant.

Depending on parameter values, an equilibrium may or may not exist. In one equilibrium, only rich voters evade and redistribution is from the middle class to the rich and poor. The reason is that in the range where only rich evade, they may benefit from higher taxes, if their income is low enough that the expected fine they pay is lower than the grant received. The poor do not evade but have low enough income that they are subsidized by the grant even though they pay their full taxes. The middle class, however, do not evade, and their income is high enough that the tax payment exceeds the transfer.

Again, this equilibrium has an ends against the middle property, but redistribution is again from the middle class to the poor and rich. Roine (2003) analyzes model with legal

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<sup>24</sup>Roine's paper is very similar. Here individuals are assumed to avoid a given fraction of their income if they invest a fixed amount into avoidance.

tax avoidance instead of illegal evasion. The population is divided into avoiders and honest taxpayers, with richer people avoiding and poorer paying taxes. The model's features thus are very similar.

## 9. Conclusion

This paper has reviewed voting models of income redistribution. The starting point was the RRMR model, which has been influential in the literature but has failed to garner convincing empirical evidence in its support. Starting from there, I have presented models which lead to different predictions. In particular, it may be that redistribution does not run simply from rich to poor. If political power increases with income, redistribution may run from poor to rich. The same holds if the government provides goods or services which disproportionately benefit the rich, such as education. Education is also an example where ends-against-the-middle equilibria can occur when individuals can go to private instead of public school. In other models, for instance, public pensions or redistribution with tax evasion, it may be that the ends are also pitted against the middle, but the ends may actually win the redistributive gain since the middle class pay taxes without receiving substantial benefits.

To conclude, there are many reasons why the RRMR model does not always receive support from the data. From this survey, a couple of themes emerge. First, it may be that the rich use the political machinery more effectively or are able to escape the transfer state through tax evasion so redistribution may not run simply from rich to poor. Second, it may be that the RRMR hypothesis holds for some transfers, such as cash transfers to the poor, but for others this is not true since the middle or upper income classes benefit more from certain spending categories such as education. Since most of the spending categories considered here are relatively broad and important items in industrial democracies, it would seem possible that aggregating does not lead to a positive link between inequality and redistribution.

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