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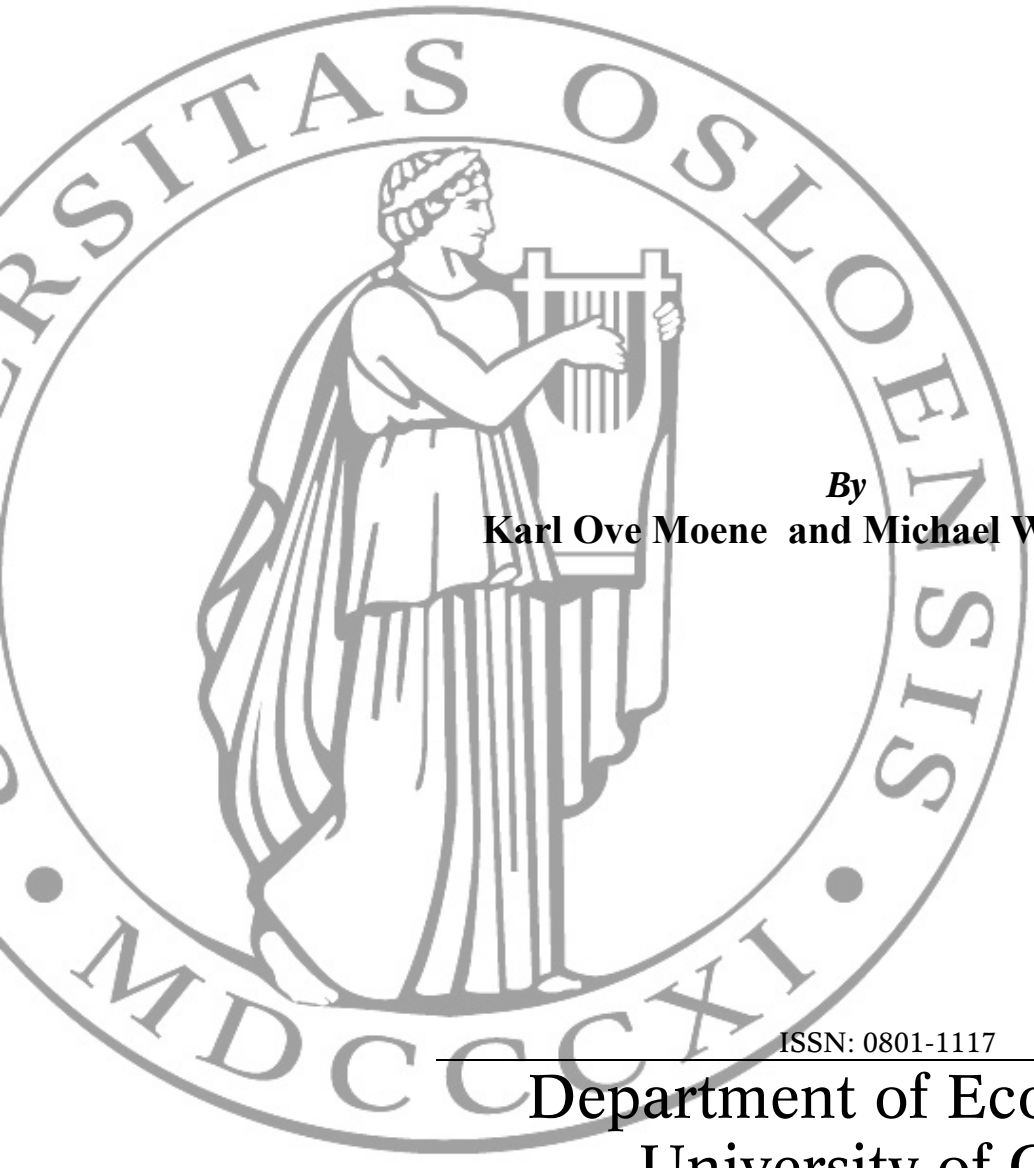
Income Inequality and Welfare spending:
A disaggregated Analysis



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Income Inequality and Welfare Spending: A Disaggregated Analysis

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March 2003

Abstract

The welfare state is generally viewed as either providing redistribution from rich to poor or as providing publicly-financed insurance. Both views are incomplete. Welfare policies provide both insurance and redistribution in varying amounts, depending on the design of the policy. We explore the political consequences of the mix of redistribution and insurance in the context of studying the impact of income inequality on expenditures in different categories of welfare spending in advanced industrial societies from 1980-1995. We find that spending on pensions, health care, family benefits, poverty alleviation and housing subsidies is largely uncorrelated with income inequality, but that spending on income replacement programs such as unemployment insurance, sickness pay, occupational illness and disability are significantly higher in countries with more egalitarian income distributions. We show that this pattern is exactly what a theory of political support for redistributive social insurance programs would predict.

1 Introduction

Governments collect and spend around 45 per cent of GDP on average in advanced industrial societies, and about half of government spending goes to fund the variety of expenditures on transfer payments and services that constitute what is commonly called the welfare state. Perhaps the most common view of welfare spending is that these policies are the outcome of a long political struggle in which workers and their allies used the power of the ballot box to obtain some redress for the inequalities generated by the market. In the words of Huber and Stephens "The struggle of welfare states is a struggle of distribution, and thus the organizational power of those standing to benefit from redistribution, the working and lower middle classes, is crucial (2001: 17).[1] Other scholars have emphasized the political influence of the beneficiaries of welfare spending who are outside the labor market, such as the elderly (Pampel and Williamson 1989). But whether the key groups are defined by class position, income or age, most scholars have viewed welfare policies in redistributive terms.

The redistributive view of welfare policy, as formalized in a series of papers by Romer (1975), Roberts (1977), and Meltzer and Richard (1981), implies that higher inequality of market incomes generates higher levels of political support for redistributive policies. The basic intuition is that low income earners have more to gain and less to lose from expansions of welfare spending than persons with high incomes. Thus, the poorer the majority of voters relative to the average income, the greater the expected support for welfare expenditures. In the one-dimensional model of voting over welfare spending where the voter with median income is decisive, the key statistic is the ratio of the median income to the mean income. The more skewed the distribution of income or, more precisely, the lower the ratio of the median

to the mean income, the higher the level of welfare expenditures desired by a majority of voters. Welfare policy is expected to "lean against the wind" in the sense that the greater the inequality of pre-tax and transfer inequality, the greater the electoral support for government policies that redistribute from rich to poor.

An alternative view of the welfare state is that social insurance policies provide insurance rather than redistribution. As Baldwin observed in a study of the origins of the welfare state in five European countries, "Protection against risk has been sought more universally than a redistribution of resources" (1990: 18).[2] Of course, all insurance policies are redistributive in the sense that fire insurance redistributes resources from those lucky enough to never experience a fire in their house to those who have. Nevertheless, fire insurance is not redistributive *ex ante.* We do not expect fire insurance to be more popular among the poor than among the rich.[3]

The typical social insurance program, however, is neither purely redistributive nor purely protection against risk but a mixture of the two. Social insurance policies in advanced industrial societies typically provide insurance against common risks on terms that are more favorable for low-income individuals than for high-income individuals. In this paper, we suggest that neither redistribution nor insurance alone can explain how income inequality affects the demand for social insurance. It is the mixture of the two motives, which differs from one social insurance policy to another, that determines the relationship between the distribution of income and support for welfare expenditures.

We begin by showing that an extension of the Romer, Meltzer and Richard framework to include the provision of insurance on redistributive terms generates predictions concerning the impact of inequality on support for social insurance expenditures that depend on the mixture of redistribution and insurance in the policies' design. We then conduct an em-

pirical examination of the impact of income inequality on welfare spending disaggregated into spending on pensions, publicly financed health care, insurance against unanticipated income loss, family benefits, housing subsidies and poverty alleviation. We find little or no relationship between income inequality and expenditures as a share of GDP for pensions, health care, family benefits and means-tested policies. In contrast, we find significantly lower spending in countries with higher income inequality for social insurance policies that provide income support for workers who have lost their income because of layoffs, ill health or accidents, policies that constitute about 30 per cent of total social insurance spending. Instead of "leaning against the wind," a substantial share of welfare spending is better characterized as "bending in the wind," that is declining as inequality increases. This pattern is exactly what a simple model of voting over redistributive insurance predicts.

Our study is not the first to present evidence that the relationship between income inequality and social insurance expenditures in advanced industrial societies is not consistent with a purely redistributive model. Among OECD countries, Rodriguez (1998) and Moene and Wallerstein (2001) found higher income inequality to be associated with lower social insurance spending as a share of GDP. In the US, Rodriguez (1998) found no relationship between welfare spending and inequality at the state level while Moffitt, Ribar and Wilhelm (1998) found spending on AFDC to be lower in states where the distribution of income was most unequal. Using a broader sample of 50 rich and poor countries, Perotti (1996) found no significant relationship between inequality and social insurance spending.[4]

The contribution of this paper is to examine the differences that exist among the main categories of social insurance in the relationship between income inequality and expenditures, differences that are obscured in studies of aggregate welfare spending. In the next section of the paper, we describe a simplified version of the model of voting over redistributive insurance

originally presented in (self-reference) and the comparative static results concerning income inequality and support for social insurance expenditures. In the third section, we analyze disaggregated data on welfare expenditures in OECD countries and find strong support for the analytical framework of section 2. In the fourth and final section, we summarize our findings and discuss other possible explanations of the differences we observe among social insurance programs in the relationship between inequality and expenditures. The proofs of the claims made in section 2 are presented in Appendix A.

2 Theoretical Framework

The argument of this paper rests on a simple model of politics: Voters are assumed to have well-defined, strictly single-peaked preferences over the level of funding for each of the various social insurance policies that depend on each voter's income relative to average income. With strictly single-peaked preferences that depend on voters' income, the voters with the median income are pivotal in the sense that the median voters' preference between any two alternatives is always shared by a majority of the electorate. In such an environment, it is natural to identify the median voters' ideal policy as the political equilibrium. Electoral competition between two parties or two blocs of parties, as in Scandinavian-style multi-party systems where the parties organize into "socialist" and "bourgeois" blocs, forces both the Right and the Left to compete for the support of voters around the median of the income distribution. Regardless of which party wins the election, the policy that is adopted is close to the policy preferred by the median group of voters.

This highly stylized model of the politics of social insurance can be criticized on many counts. Voters, it is claimed, are generally ill-informed about policy choices (Kinder 1983). Instead, many have argued that welfare policy is determined by the political influence of the

labor movement (Korpi 1978, Hicks 1999, Huber and Stephens 2001, Wilensky 2002), the policy innovations of bureaucrats (Heclo 1974), or even the preferences of employers (Swenson 2002). In the formal literature, the two-party, one dimensional model of redistributive politics has been extended to include more than two parties (Austen-Smith 2000) and more than one policy dimension (Roemer 2001, 2003; Austen-Smith and Wallerstein 2002).

Nevertheless, in this paper we rely on the one-dimension, two-party model of redistributive politics developed by Romer and Meltzer and Richard extended to cover social insurance. While unions, bureaucrats and employers have all played important roles in negotiating the details of social insurance policies, in the end social insurance policies are adopted or not by parties or coalitions of parties that manage to win a majority of votes. Voters may know little or nothing about the details of the policy choices facing legislators but if voters vote retrospectively, rewarding the incumbent government if their welfare increases and punishing the incumbent otherwise, the parties in government have a strong electoral incentive to adopt policies that raise the welfare of a majority of voters (Achen and Bartels 2002). For these reasons, we believe that the policy preferred by a majority of voters to all alternatives, when such a policy exists, is an important (albeit not necessarily the only) determinant of the policies that are adopted. But before the Romer, Meltzer and Richard framework can be expected to explain the politics of social insurance, the model must be modified to include risk.

Consider an electorate composed of self-interested, risk-averse voters who differ in their income when employed but face a common risk of losing their employment in the next period. In particular, we will rely on the following assumptions:

1. The distribution of wages and salaries is lognormal. Let σ^2 denote the variance of the log of wages. Since we will consider changes in inequality (that is, in σ^2), holding the

average wage constant, there is no loss of generality in assuming the average wage equals one.

2. All voters receive a known wage with probability π. There is, however, a non-zero probability, $(1-\pi)$, that each voter will lose his or her income because of unemployment, injury or illness. To keep the model as simple as possible, the probability of being employed, π, is assumed to be the same for all voters.[5]

3. Voters are assumed to be identical in terms of their aversion to risk, as characterized by the coefficient of relative risk aversion, $\mu \equiv -cu''(c)/u'(c)$ where $u(c)$ represents voters' preferences over consumption, c. We assume that $\mu > 1$ and that μ is constant.[6]

4. Social insurance expenditures are financed by a flat tax on wages, $t \in [0, t_{\max}]$.[7] Taxation is assumed to impose a deadweight cost which we model implicitly by assuming that total tax revenues per capita, T, is given by a twice differentiable function of the tax rate, $\tau(t)$, multiplied by average earnings, π (since the fraction π are working and the average wage is one), or $T(t) = \pi\tau(t)$. The function $\tau(t)$ is assumed to satisfy the following properties: (i) $\tau(0) = 0$ (no taxes are collected when the tax rate is zero); (ii) $\tau'(0) = 1$ (there is no deadweight loss at $t = 0$); (iii) $\tau''(t) < 0$ (the deadweight cost of taxation rises as the tax rate increases); and (iv) $\tau'(t_{\max}) = 0$ for some $t_{\max} < 1$ (there is some tax rate $t_{\max} < 1$ beyond which further increases in the tax rate do not increases tax revenues).

5. Social insurance policies are represented by two functions, $b_E(w,t) \geq 0$ and $b_N(w,t) \geq 0$, where $b_E(w,t)$ represents the transfer payment received by an employed worker who earns a wage of w and $b_N(w,t)$ represents the transfer payment received by a worker without employment when the tax rate is t. Note that the benefit may be a function of the worker's wage or, in the case of a worker without current employment, the worker's

past wage.

Voters' preferences over social insurance expenditures are derived from their expected utility

$$Eu = \pi u(c_E) + (1 - \pi)u(c_N) \tag{1}$$

where c_E is the voter's after-tax and transfer income when employed and c_N is the voter's income when not employed. After-tax, after-transfer income when employed is equal to the after-tax wage $(1 - t)w$ plus the welfare benefit, or $c_E = (1 - t)w + b_E(w, t)$. Voters who are not working receive $c_N(w) = b_N(w, t)$.

A voter's ideal policy is the tax rate or spending level that maximizes (1) subject to the budget constraint that

$$\int_0^\infty [\pi b_E(w, t) + (1 - \pi)b_N(w, t)]\, dF(w) = \pi\tau(t) \tag{2}$$

where $F(w)$ is the cumulative density function of the wage distribution. Equation (2) states that the average of benefits received by those employed and those not employed at each wage level must equal tax revenues per capita. Since voters have strictly single-peaked preferences, the tax rate or benefit level preferred by the voter who receives the median wage is preferred by a majority to any other alternative. Therefore, we identify the preferred policy of the voter with median income as the political equilibrium.

Different social insurance policies can be represented by different specifications of the functions $b_E(w, t)$ and $b_N(w, t)$. Consider, as a benchmark, the simple case in which all benefits are paid as equal lump-sum payments to employed workers, or $b_E(w, t) = b(t)$ and $b_N(w, t) = 0$. The budget constraint implies that $b(t) = \tau(t)$. This is a purely redistributive policy that provides no insurance against job loss. In this case, an increase in pre-tax inequality increases the equilibrium level of spending, as stated in the first claim.:

Claim 1 When $b_E(w,t) = b(t)$ and $b_N(w,t) = 0$, the equilibrium tax rate and benefit level increase as inequality increases.

The proof of this and all other claims are presented in Appendix A. This claim simply reproduces the main result of the Romer, Meltzer and Richard model of voting over redistributive spending. An increase in the variance of a lognormal distribution, holding the mean constant, implies a decline in the median income. From the point of view of the median voter, a given benefit can now be obtained at a lower price (since the median voter's share of the tax burden declines as the median voter's income falls). Hence, the median voter prefers a higher level of expenditures.

Social insurance policies, however, do not pay benefits to currently employed workers only. Social insurance policies either target benefits to those who are not currently employed (such as unemployment insurance) or provide benefits to everyone (such as health care). Consider, first, the family of policies that provide income replacement for those who have lost their earnings due to unforeseen circumstances such as layoffs, sickness or accidents. The benefits from income replacement policies are only received by workers without current employment, implying $b_E(w,t) = 0$. In addition, benefits are typically tied to past earnings according to a redistributive formula which we write as $b_N(w,t) = [\xi + (1-\xi)w]\, b(t)$ where $0 < \xi \leq 1$.[8] In other words, income replacement policies are assumed to provide an income floor of $\xi b(t)$ plus the fraction $(1-\xi)b(t)$ of past earnings. The term $b(t)$ is the average benefit received by those who receive benefits. Since taxes are collected from the fraction π of the population while benefits are paid to the fraction $(1-\pi)$, the budget constraint implies that: $b(t) = [\pi/(1-\pi)]\, \tau(t)$.

In contrast to the case where the benefit is paid to those who are employed, an increase in inequality reduces the demand for welfare spending when the benefit is received by those

without employment, as stated in the second claim.

Claim 2 When $b_E(w,t) = 0$ and $b_N(w,t) = [\xi + (1-\xi)w]\, b(t)$ where $0 < \xi \leq 1$, the equilibrium tax rate and benefit level decreases as inequality increases.

In this case, a reduction in the income of the median voter has two effects that work in opposite directions. As in the previous case, the price of a given level of benefits for the median voter declines, thereby increasing the median voters' demand for expenditures. But now there is an income effect that pushes in the opposite direction. A decline in the income of the median voter reduces the amount of insurance the median voter wishes to purchase. We demonstrate in Appendix A that the income effect dominates the price (or substitution) effect in this case which implies that support for benefits for those without employment declines as inequality increases.

Note that it is the mixture of redistribution and insurance that causes the benefit preferred by voters with below-average income to rise as inequality falls. When income replacement policies are redistributive, a change in the wage distribution will cause after-tax wages to change by a greater proportion than the social insurance benefit. Workers whose after-tax income has risen relative to the social insurance benefit prefer to increase the benefit a little, even at the cost of a higher tax. Conversely, workers whose after-tax income has fallen relative to the social insurance benefit prefer to reduce the benefit a little in order to restore some of their after-tax income when working. Thus, a mean-preserving decline in inequality that raises the wage of the majority of workers who earn less than the average also raises the level of social insurance spending that the majority prefers.

In contrast to social insurance against unforeseen income loss, social insurance programs like health care are universalistic in the sense that the benefit provided is the same at all income levels, and is received whether or not the beneficiary is currently employed. A rea-

sonable characterization of programs like health care is simply $b_N(w,t) = b_E(w,t) = b(t)$.[9] Pensions are like health care and unlike unemployment insurance in the sense that public pension systems provide income upon reaching retirement age to all workers. Unlike health care, however, pensions depend upon earnings, typically with a redistributive formula for calculating benefits (Korpi and Palme 1999). Pensions, therefore, might be represented by $b_N(w,t) = b_E(w,t) = [\xi + (1-\xi)w]\,b(t)$, with $\xi \in (0,1)$. The third claim covers both programs such as health care and family benefits, where $\xi = 1$, and pensions, where $\xi < 1$.

Claim 3 When $b_E(w,t) = b_N(w,t) = [\xi + (1-\xi)w]\,b(t)$ where $0 < \xi \leq 1$, the equilibrium tax rate and benefit level may either increase or decrease as inequality increases. In particular, the equilibrium tax and benefit increases as inequality increases if the coefficient of relative risk aversion, μ, is sufficiently close to one, while the equilibrium tax and benefit declines as inequality increases if μ is sufficiently large.

Whether benefits are lump-sum ($\xi = 1$) or depend on earnings ($\xi < 1$), the equilibrium level of benefits is an increasing function of inequality when $\mu \to 1$ and a decreasing function of inequality when $\mu \to \infty$. For moderate levels of risk aversion greater than one, the effect of inequality on spending can go either way. The median voter's preference for greater redistribution and less insurance as the median income falls relative to the mean roughly counter-balance each other.

Finally, there are policies that are explicitly targeted for poverty alleviation. Means-tested policies, which comprise a minor part of the welfare budget but an important part of the budgets of very poor households in advanced industrial societies, cannot be examined in a model of self-interested voting. The probability of receiving payments targeted for poverty alleviation are virtually zero for a majority of voters. Support for such policies must be based on factors such as altruism or fear of criminal acts by the desperately poor.

To summarize the results that can be derived from an extension of the Romer, Meltzer and Richard framework to include the risk of job loss, the relationship between pre-tax income inequality and equilibrium level of expenditures on social insurance policies depends on the policy's design. Spending on redistributive social insurance policies targeted to those who have lost their income unexpectedly because of layoffs, sickness or accidents is predicted to be higher in countries with more egalitarian distributions of pre-tax and transfer income. In contrast, spending on social insurance benefits that are received by all workers is not predicted to have a strong relationship with inequality one way or the other.

Our assumption that the risk of job loss is uncorrelated with the wage is not critical. None of the results are altered by allowing the risk of job loss to depend on a workers' position in the income distribution provided the worker with the median ideal point with regard to social insurance expenditures has below-average income. It is important to note that the redistributive insurance framework does not imply that high-wage workers desire higher spending on income replacement policies than low-wage workers. The demand for insurance depends on risk as well as on income. Low wage workers may express greater support for unemployment insurance than high-wage workers, for example, since the probability of being laid off is higher for low-wage workers. What the redistributive insurance framework implies is that a worker's demand for unemployment insurance would increase if the worker's income increased while the risk of job loss remained constant. In a comparison of two countries with the same distribution of the risk of income loss but different distributions of income, the more skewed the distribution of income, the *lower* the level of social insurance targeted to those temporarily without work desired by a majority of voters.

3 Empirical Analysis

In this section, we compare the empirical relationship between the main categories of social insurance spending and income inequality in 18 OECD countries from 1980 to 1995. We begin with a discussion of the data used in the statistical analysis and of the methodological issues that we confronted and then discuss our empirical results. Details regarding data sources can be found in Appendix B.

3.1 Description of the Data

According to OECD statistics (OECD 1999), social insurance expenditures averaged 23 per cent of GDP and 51 per cent of total government spending in advanced industrial societies between 1980 and 1995. The welfare budget can be divided into three large categories and three smaller categories. Pensions (old age cash benefits) make up 30 per cent of the welfare budget on average. Public spending on health consumes an average of 26 per cent of welfare spending. Policies that provide income support in a wide variety of circumstances (unemployment, disability, sickness, occupational injury, death of a spouse) comprise 31 per cent of social insurance expenditures on average. The remaining 13 per cent of the welfare budget is spent on benefits and services for families with children (9 per cent of welfare expenditures), benefits targeted to low income individuals, refugees and indigenous groups (3 per cent of welfare expenditures) and housing subsidies (1 per cent of welfare expenditures). It is interesting to note how small the share of spending on policies explicitly dedicated to poverty alleviation. Government spending in what is known as "welfare" in the US, that is programs in which eligibility for benefits is primarily based on low income, average only 0.6 per cent of GDP in advanced industrial societies. Table 1 presents summary statistics for our dependent variables, while Table 6 in Appendix B presents country means for each of

the main categories of social insurance spending.

In the one-dimensional model of voting over welfare, support for welfare expenditures depends on the ratio of the income of the median voter to the mean income. Unfortunately, data on the ratio of the median to the mean income is limited. However, the OECD has published data on the ratio of earnings at different percentiles of the earnings distribution covering most OECD countries from 1980 through 1995 (OECD 1993, 1996). The data refer to the annual income from wages and salaries received by full-time employees, including both men and women. We can use the fact that the distribution of wages and salaries is well-approximated by the lognormal distribution to write the ratio of the median earning to the mean as:

$$\frac{\text{median}}{\text{mean}} = \exp(-\sigma^2/2) \tag{3}$$

where σ^2 is the variance of the log of wages.[10] The variance of the log of wages, in turn, can be derived from the ratio of the wage at any two percentiles of the earnings distribution according to the formula

$$\sigma = k_{ij} \ln(w_i/w_j) \tag{4}$$

where w_i is the wage or salary received by a worker at the ith percentile of the earnings distribution and w_j is the wage or salary received by a worker at the jth percentile of the earnings distribution with $j < i$, and k_{ij} is a positive constant that depends on i and j. Equations (3) and (4) imply that $\ln(w_i/w_j)$ is a reasonable proxy for the ratio of the median income to the mean.

The OECD provides data on the 90/10, 90/50 and 50/10 wage ratios. As equations (3) and (4) indicate, the statistical results should not depend on the wage ratio that is used. In practice, the lognormal distribution is a good approximation but not a perfect characterization of the actual distribution of wages and all variables are measured with error.

Therefore, we used all three available wage ratios in our analysis. To save space, we only report the results using the 90/10 wage ratio but none of our findings are significantly different when the 90/10 wage ratio is replaced by either the 90/50 or the 50/10 wage ratio.

Because wage and salary inequality data is not available on an annual basis for many countries and because we do not think that small annual changes in distribution of income have an immediate political impact, we used the average value of the 90/10 wage ratio for each five year period. That is, to explain social insurance expenditures in, say 1985, we use the average of all measures of the 90/10 wage ratio that are available for the time period 1980-1984. Thus, our data set consists of data on spending in various social insurance programs as a share of GDP in the 18 countries in the years 1985, 1990 and 1995 with measures of wage inequality (and most other control variables) averaged over the time periods, 1980-1984, 1985-89 and 1990-94. We have 50 observations after subtracting the four cases in which there is no measure of wage inequality within the five-year time period.[11]

On average, a worker at the 90th percentile received three times the earnings of a worker at the 10th percentile. The most egalitarian earnings distribution in the data set is Norway in 1990-94, where the ratio of earnings at the 90th percentile to earnings at the 10th percentiles was less than two to one. The least egalitarian earnings distribution was achieved by the US in 1985-89, when workers at the 90th percentile received a wage or salary that was 5.5 times the earnings received by workers at the 10th percentile.

As control variables, we include the dependent variable lagged one period (5 years), the rate of unemployment, the share of elderly in the population, voter turnout, and a measure of Conservative party participation in government. We discuss each briefly in turn.

Lagged dependent variable: Budgeting is incremental. The best single predictor of next period's welfare budget is the current welfare budget. Indeed, the simple regression of current

total social insurance spending on past total social insurance spending (plus a constant) yields an R^2 of 87.7 per cent.[12] Therefore, we include the lagged dependent variable in the set of regressors.

Unemployment rate: Once the parameters of unemployment insurance are fixed, expenditures on unemployment benefits vary directly with the rate of unemployment. Expenditures on active labor market policies and even disability insurance may also be sensitive to the unemployment rate. Thus, we include the rate of unemployment in the same year as the data on expenditures when analyzing categories of spending that might be sensitive to the unemployment rate.[13]

Share of elderly in the population: Government spending on pensions and health care may be affected by the share of elderly in the population, both because the larger the share of elderly, the greater the need for spending to maintain the elderly in reasonable comfort and because the larger the share of elderly, the larger the share of the electorate with a keen interest in spending on pensions. We use the average share of elderly in the population in the previous five years (as is appropriate if the share of elderly primarily measures the political strength of the elderly) rather than in the same year (as would be appropriate if the share of elderly primarily measures need) because the five-year average fits the data better than the same year figure, although the difference in fit is small.

Turnout: Since the electorate is not a representative sample of the adult population as a whole, the level of turnout may affect support for welfare expenditures, as argued by Lijphart (1997) and Franzese (2002). Therefore, we include the average turnout in elections to the lower house of parliament (except in the US where we use turnout in presidential elections) in each five year period.

Partisan composition of government: The simple spatial model of electoral competition

between two parties in one dimension in the absence of uncertainty predicts that the two parties offer identical policies in equilibrium. In the presence of uncertainty about the precise electoral consequences of offering one policy rather than another, however, parties that care about policy outcomes (and not just about winning) would propose divergent policies in equilibrium (Roemer 2001). With uncertainty, the positions of parties that care about policy choices represent a compromise between the policy that maximizes the probability of winning (that is the policy preferred by the median voter) and the policy the party would most like to implement. Therefore, we include the party in power as a control. Like many others, we find the greatest partisan difference with respect to welfare expenditures is that which separates conservative parties from both center and left parties (Castles 1992, Esping-Andersen 1990).[14] Accordingly, we use the average share of cabinet seats held by conservative parties in each period as our measure of the partisan composition of government. Summary statistics for our dependent and independent variables are listed in Table 1.

Table 1 about here

Finally, it is worth discussing common controls that we do not include. We do not include measures of union density, union concentration or the centralization of bargaining, since previous studies have identified these variables as being the primary determinants of the inequality of wages and salaries.[15] Our assumption is that the effect of union organization and wage-setting institutions on welfare expenditures is indirect. Unions and wage-setting institutions affect the distribution of income which, in turn, affects the political support for social insurance. The relationship between organization of the labor market and wage inequality is so close that it is impossible to separate the effect of union strength *per se* from the effect of a more egalitarian wage distribution.

We also experimented with controls for per capita GDP, trade openness (imports plus

exports as a share of GDP), a dummy variable for federal systems of government as suggested by Huber, Ragin and Stephens (1993), a dummy variable for systems of proportional representation and a measure of union participation in government policy formation and implementation with respect to non-wage issues developed by Traxler, Blaschke and Kittel (2001).[16] None of these variables altered our results concerning inequality and all proved to be statistically insignificant in most of the specifications that we tried.

3.2 Methodological Issues

The model we estimate is

$$y_{i,t} = \alpha + \beta y_{i,t-5} + \gamma \cdot \text{Inequality}_{i,t} + \delta' x_{i,t} + u_{i,t} \tag{5}$$

where $y_{i,t}$ is spending as a share of GDP in country i in year t, $(t = 1985, 1990, 1995)$, $\text{Inequality}_{i,t} \equiv \ln(w_{90}/w_{10})$ using the average value of w_{90}/w_{10} in country i from $t-5$ to $t-1$ and $x_{i,t}$ is the vector of control variables. Two methodological issues arise. The first is the question of the exogeneity of our right-hand-side variables. The second concerns likely deviations from the standard assumptions regarding the variances and covariances of the error terms.

Two right-hand-side variables, in particular, might be suspected of being endogenous. Few economists would accept the assumption that the rate of unemployment is exogenous with respect to spending on unemployment benefits. Since we are not concerned in this paper with accurately measuring the impact of the unemployment rate on welfare spending, the endogeneity of unemployment only matters to the extent that it alters our inferences regarding γ in equation (5). Removing the unemployment rate from the set of controls results in only minor changes in the point estimates of γ and the associated standard errors. Therefore, the potential endogeneity of the unemployment rate does not affect our conclusions

regarding inequality and welfare spending.

The other variable that might be endogenous is our central variable, the inequality of wages and salaries. While the w_{90}/w_{10} ratio is calculated on the basis of pre-tax wages and salaries, the welfare system may affect the pre-tax wage and salary distribution. Here we rely on the results of Wallerstein (1999), who found that government spending had little effect on the w_{90}/w_{10} ratio after controlling for union density, the concentration of the union movement, the centralization of bargaining and the level of wage inequality in the previous period. Therefore, we maintain the assumption that the w_{90}/w_{10} ratio is determined by a country's labor market institutions and is exogenous with respect to spending on welfare policies.

The second problem concerns the implausibility of the assumption that the error terms associated with different countries in the same year are uncorrelated. The Norwegian government may not consider the US a suitable model for its social policy, but the Norwegians pay close attention to the policy choices made in Sweden and vice versa. Instead of the usual assumption that $E(uu') = \sigma^2 I$, a more plausible assumption is to allow for heteroscedasticity and cross-sectional correlation of errors. The current conventional approach in comparative politics is to use OLS to obtain point estimates, since the OLS estimates remain unbiased, but correct the estimated standard errors for heteroscedasticity and cross-sectional correlation (Beck and Katz 1995, Greene 1997). However, the small sample properties of the correction heteroscedasticity and cross-sectional correlation are unclear and our data has only three time periods.

To decide whether or not to use panel-corrected standard errors, we turned to simulations, described in Appendix C. The simulations reveal that the uncorrected estimates of the standard errors perform well, even in the presence of heteroscedasticity and cross-sectional

correlations, while the panel-corrected estimates of the standard errors perform poorly with so few time periods. Therefore, we report uncorrected standard errors in the regressions that follow.

3.3 Results

We begin with total welfare spending as a share of GDP. As column 1 in Table 2 reveals, total welfare spending is significantly and negatively related to the inequality of wages and salaries. Spending levels are lower in countries that are more unequal. Total welfare spending is also reduced by conservative parties in government and high levels of voter turnout. The estimated negative effect of turnout on social insurance spending may surprise readers. However, the electorate is both richer and older than the adult population as a whole, and the correlation between electoral participation and income is generally weaker than the correlation between electoral participation and age (Franklin 1996). Thus, lower turnout may imply an older electorate on average. Both the share of the population who are elderly and the rate of unemployment are positively associated with welfare expenditures as a share of GDP.

Table 2 about here

Aggregating all welfare programs together, however, obscures where and in what way inequality matters. In columns 2, 3 and 4, we consider the three main pillars of the welfare state, each one of which consumes roughly 30 per cent of the total welfare spending or 7 per cent of GDP. In column 2, the dependent variable is spending on pensions (old age cash benefits) as a share of GDP. In column 3, the dependent variable is government spending on health care as a share of GDP. Since there is little reason to think that the rate of unemployment matters for spending on pensions or health care, and the estimated coefficient on unemployment is not statistically significant if unemployment is included in either regression,

we removed the unemployment rate from the set of controls. It is apparent from columns 2 and 3 that inequality has little impact on spending for either pensions or health. In both cases, the estimated coefficient on inequality is not significantly different from zero.[17]

In contrast, the inequality of wages and salaries has a significant, negative effect on spending on the set of policies that provide income replacement, or insurance against the loss of income as a result of unemployment, sickness, disability, occupational illness or accidents and the death of a spouse (column 4 of Table 1).[18] The estimated impact of a permanent standard deviation increase of wage and salary inequality of one standard deviation (.25) is to change spending on income replacement programs by $-3.32 \cdot .25 \approx -0.8$ of a percent of GDP in the short run (five years) and by $-3.32 \cdot .25/(1 - .728) \approx -3.1$ per cent of GDP in the long-run. Since average spending on income replacement is 7.1 per cent of GDP in the sample, this is a large change. To illustrate with an example, the difference between the average value of $\ln(w_{90}/w_{10})$ in the UK and Sweden in the early 1990s was .45. This difference in wage inequality is estimated to be associated with a difference of spending on income replacement of $3.32 \cdot .45/(1 - .728) \approx 5.5$ per cent of GDP in the long run. The actual difference between spending on income replacement as a share of GDP in Sweden and in the United Kingdom was 7.7 percentage points in 1995 (13.2 per cent of GDP in Sweden as opposed to 5.9 per cent of GDP in the UK). Thus, the difference in wage and salary inequality between the United Kingdom and Sweden explains about 75 per cent of the actual difference in spending on income replacement as a share of GDP in the two countries.

The category of income replacement programs can be subdivided into policies that provide insurance against the risk of unemployment, that is the sum of spending on unemployment benefits and spending on active labor market policies (2.4 per cent of GDP on average) and policies that provide insurance against the risks of loss of income because of disability, sick-

ness, occupational illness and injury and death of a spouse (4.7 per cent of GDP on average). Results for each of these two subcategories of income replacement are presented in columns 5 and 6 of Table 2. Inequality is most strongly related to spending on unemployment insurance and active labor market policies, as column 5 shows, but the relationship is significant and negative for both categories of expenditures.[19] It is also worth noting that, in spite of the charge that employers, unions and governments under conditions of high unemployment encourage workers to apply for disability payments, the unemployment rate does not have a significant effect on expenditures on disability insurance as a share of GDP.

Readers may question the specification of the models displayed in Table 2. Perhaps unemployment should be dropped from column 6, since the estimated coefficient has the "wrong," i.e. unexpected, sign. Perhaps the unemployment rate should added to column 3, since unemployment may be damaging to health. Perhaps conservative government should be removed from the set of controls on the *a priori* grounds that electoral competition forces all parties to implement the same policies, as in the Downsian model. Rather than consider each possible objection, we investigated the robustness of the results in Table 2 by regressing each of the dependent variables on the lagged dependent variable, *Inequality* and every subset of the "questionable" control variables, where the "questionable" control variables are Right Government, Turnout, the Percent Elderly and the Unemployment Rate.[20]

Table 3 about here

The results are presented in the first two columns of Table 3, where we display the minimum and the maximum value of the estimated coefficient on *Inequality* over all combinations of the questionable controls for each dependent variable. Table 3 shows that the qualitative results in Table 2 with regard to the three large components of the welfare budget are robust with respect to specification uncertainty. While the effect of uncertainty regarding the

correct specification is larger than sampling uncertainty for any given specification, every specification implies that inequality is negatively associated at the .05 significance level with spending on income replacement as a share of GDP. In contrast, inequality is not significantly associated with spending on pensions as a share of GDP in any specification. In the case of government spending on health care, inequality is not significantly associated with spending as a share of GDP in most specifications.

To check whether our results could be upset by removing one of the countries from our data set, we redid the regressions of Table 2 for each subset of 17 countries. The minimum and maximum value of the estimated coefficient on *Inequality* are presented in the third and fourth columns of Table 3. Again, the estimated coefficient on *Inequality* is significant at the .05 level in every subset of 17 countries when the dependent variable is total social insurance spending (line 1), spending on income replacement (line 4) and spending on unemployment benefits (line 5) and is significant at the .05 level in all but one subset of 17 countries when the dependent variable is spending on income replacement other than unemployment benefits (line 6).[21] In contrast, the estimated coefficient on *Inequality* is not significantly different from zero in any subset of 17 countries at the .10 level when the dependent variable is spending on pensions (line 2) or health care (line 3).

Kristov, Lindert and McClelland (1992) distinguish between the political impact of inequality in the top half of the wage schedule and inequality in the bottom half of the wage schedule. Kristov et al argue that the closer the median is to the poor, that is the smaller the w_{50}/w_{10} wage ratio, the greater the willingness of voters in the middle to support welfare expenditures. In contrast, the closer the median is to the rich, i.e. the smaller the w_{90}/w_{50} ratio, the lower the willingness of voters in the middle to support welfare expenditures. In Table 4, we test the proposition that the 90/50 ratio and the 50/10 ratio have different polit-

ical effects. The equations that are estimated are identical to the corresponding equation in Table 2, with the log of w_{90}/w_{10} replaced by the log of w_{90}/w_{50} and the log of w_{50}/w_{10}. Only the coefficients on $Inequality(90/50)$ and $Inequality(50/10)$ are displayed. The estimated coefficients on inequality always have the same sign. Moreover, the null hypothesis that the coefficient on $\ln(w_{90}/w_{50})$ and the coefficient on $\ln(w_{50}/w_{10})$ are the same is never rejected. Therefore, our use of $\ln(w_{90}/w_{10}) = \ln(w_{90}/w_{50}) + \ln(w_{50}/w_{10})$ as the measure of inequality in Table 2 is justified.

Table 4 about here

Pensions, health spending and income replacement constitute most, but not all, of the welfare budget. In Table 5, we present an analysis of the remaining part, divided into family benefits and services (2 per cent of GDP on average), and programs targeted to low income individuals, refugees and indigenous groups plus housing subsidies (1 per cent of GDP on average). Column 1 reveals that none of the independent variables are good predictors of spending on family benefits, with the exception of the lagged dependent variable. The second column of Table 5 indicates that conservative parties in government are associated with more spending on housing subsidies and antipoverty programs, which probably reflects the preference of conservative parties for narrowly targeted over broadly targeted programs. In addition, countries with high rates of unemployment spend more on benefits targeted to those with low income. In neither category, however, is spending significantly associated with the inequality of wages and salaries.

Table 5 about here

4 Conclusion

The empirical relationship between inequality and social insurance spending as a share of GDP in advanced industrial societies differs across policies. For many policies–pensions, health care, family benefits, poverty alleviation–spending is largely uncorrelated with the inequality of wages and salaries. But for a significant set of policies that constitute roughly 30 per cent of the welfare benefit–unemployment insurance, active labor market policies, sickness pay, disability insurance and occupational illness and injury–spending is significantly more generous in countries with a relatively egalitarian pre-tax distribution of wages and salaries. The differences in the relationship between income inequality and social insurance spending across policy areas can be explained by extending the Romer, Meltzer and Richard model to incorporate the fact that welfare policies provide insurance as well as redistribution. The demand for redistribution increases when income falls, but the demand for redistributive insurance increases when income rises. Thus an increase in inequality that lowers the income of the median voter relative to the mean generates two counteracting effects. With two counteracting effects, the impact of inequality on support for welfare spending depends on the policy. Inequality lowers support for spending in policies that provide insurance against unexpected loss of income. In welfare policies where the benefits are received by all, independently of current employment status, the two effects work roughly balance each other such that there is little or no relationship between income inequality and spending levels. The fact that we failed to find any category of welfare spending where inequality clearly raises welfare spending can be explained by the absence of social insurance policies designed purely to provide redistributive benefits among active participants in the labor market.

There are other possible explanations of the empirical pattern we found. Iversen and Soskice (2001) suggest a variant of the insurance argument that emphasizes the relative im-

portance of firm-specific versus general skills. According to Iversen and Soskice, the demand for insurance against job loss is greater in countries where firm-specific skills predominate, since firm-specific skills are lost by definition when workers leave their firm. In countries where general skills predominate, the demand for insurance against job loss is less since the cost of job loss is less. In fact, there is a close empirical relationship between wage equality and the measures of firm-specific skills used by Iversen and Soskice.[22] An egalitarian wage schedules that compresses the wage differential between workers at different skill levels increases employers' incentive to invest in firm-specific training and reduces workers' incentive to invest in general training (Acemoglu and Pischke 1998). Thus, the effect of the wage distribution on the relative importance of firm-specific versus general skills is another route by which greater wage equality may increase the demand for social insurance against job loss.

An different approach is to emphasize the effect of wage inequality on the disincentive effects of income replacement policies, as suggested by Moffitt, Ribar and Wilhelm (1998). Moffitt et al argue that if wages at the bottom of the income scale are low, then the income floor provided by social insurance benefits cannot be high before living on the dole becomes preferable to working for unskilled workers. The higher are wages at the bottom, the higher the income floor provided by social insurance can be without creating severe disincentive effects. Such disincentive effects are less important for publicly provided health insurance or pensions. While there is some discussion of ways to keep the elderly in the work force, voters are much more concerned about working age adults choosing to live on social insurance benefits instead of seeking employment than they are about the labor force participation of retirees.

The political influence of unions, frequently cited as one of the most important determinants of cross-national differences in social insurance spending, cannot, in our view, easily

account for the differences that exist in the relationship between wage equality and social insurance spending across major policy categories. There is no evidence that we are aware of to suggest that unions care less about pensions and health care than about income replacement programs. After all, retirees make up a significant fraction of union members in Europe today (Ebbinghaus and Visser 2000). Unions increase workers' ability to obtain the policies that workers want, but unions also change workers' preferences over policies. It is the indirect effect of unions in changing workers' preferences over social insurance policies by changing the distribution of income that offers an explanation for the differential impact of inequality on spending across policy categories that we have found in the data.

In conclusion, there is more than one reason why spending on social insurance against income loss from layoffs, sickness or accidents might be greater in countries with lower levels of income inequality. We have emphasized the direct impact of wage equality on the political support for redistributive insurance policies against job loss. Iversen and Soskice focus on the relative importance of firm-specific versus general skills. Moffitt, Ribar and Wilhelm argue in terms of the disincentive effects of income replacement policies when wage inequality is high. The negative impact of income inequality on support for spending on important categories of social insurance, in turn, helps explain the strong association of pre-tax and transfer income inequality and the proportion of households whose post-tax and transfer income falls below the poverty line.[23] Inequality matters for poverty, not because (or not only because) employed workers are paid so little, but because income inequality reduces political support for important categories of social insurance spending.

5 Appendix A: Proofs of the Claims in the Text

The ideal point of a voter with income w is given by the solution to the following problem

$$\begin{aligned} \max_t E(u) &= \pi u(c_E) + (1-\pi)u(c_N), \text{ where} \\ c_E &= (1-t)w + b_E(w,t) \\ c_N &= b_N(w,t) \end{aligned}$$

subject to the budget constraint

$$\int_0^\infty [\pi b_E(w,t) + (1-\pi)b_N(w,t)]\, dF(w) = \pi\tau(t)$$

The first-order condition for the voters' maximization problem can be written as

$$H(w,t^*) = \lambda\tau'(t^*) - u'(c_E)w = 0 \tag{6}$$

where t^* is the optimal tax rate and λ (the Lagrangian multiplier) is the utility gain from a marginal increase in the per capita welfare budget $T(t)$. Equation (6) states that the gain in expected utility from a marginal increase in the tax rate, $\lambda T'(t) = \lambda\pi\tau'(t)$, just equals the expected utility cost of the tax increase, $\pi u'(c_E)w$. Equation (6) is not sufficient to characterize the solution, since λ depends on the definitions of the benefit functions $b_E(w,t)$ and $b_N(w,t)$ that describe different social insurance programs.

The wage of the median wage-earner is $w_M = \exp(-\sigma^2/2)$ when the mean wage equals one with a lognormal distribution. We can derive the impact of inequality on the political equilibrium by calculating

$$\frac{dt^*}{d\sigma^2} = -\sigma w_M \left(\frac{dt^*}{dw_M}\right) = \sigma w_M \left[\frac{\partial H(w_M,t^*)/\partial w_M}{\partial H(w_M,t^*)/\partial t^*}\right]$$

The second-order condition $\partial H(w_M,t^*)/\partial t^* < 0$ is satisfied in all of the cases considered in the paper. It follows that:

$$\text{sgn}\left(\frac{dt^*}{d\sigma^2}\right) = \text{sgn}\left[-\frac{\partial H(w_M,t^*)}{\partial w_M}\right]$$

Therefore, we prove the claims in the papers by calculating the sign of $-\partial H(w_M, t^*)/\partial w_M$.

Proof of Claim 1: When $b_N(w,t) = 0$ and $b_E(w,t) = b(t) = \tau(t)$, equation (6) simplifies to

$$H(w_M, t^*) = \tau'(t^*) - w_M = 0 \tag{7}$$

where w_M is the ratio of the median income to the mean (since the mean wage is assumed to equal one). Note that $\lambda = u'(c_E)$ in (7), since the benefit is received when employed. From (7), it follows immediately that $-\partial H(w_M, t^*)/\partial w_M = 1 > 0$.

Proof of Claim 2: When $b_E(w,t) = 0$ and $b_N(w,t) = [\xi + (1-\xi)w]b(t)$, equation (6) becomes

$$H(w_M, t^*) = u'(c_N)\left[\xi + (1-\xi)w_M\right]\tau'(t^*) - u'(c_E)w_M = 0, \tag{8}$$

In (8), $\lambda = u'(c_N)\left[\xi + (1-\xi)w_M\right]$ since the benefit is received when not employed and the median worker receives the multiple $[\xi + (1-\xi)w_M]$ of $b(t)$. Differentiating (8) and simplifying yields

$$-\frac{\partial H(w_M, t^*)}{\partial w_M} = \left(\frac{\xi}{\xi + (1-\xi)w_M}\right) u'(c_E)(1-\mu) < 0$$

since $\mu > 1$ and $0 < \xi \leq 1$.

Proof of Claim 3: When $b_E(w,t) = b_N(w,t) = [\xi + (1-\xi)w]b(t)$, and equation (6) becomes

$$H(w_M, t^*) = \left[\pi u'(c_E) + (1-\pi)u'(c_N)\right]\left[\xi + (1-\xi)w_M\right]\tau'(t^*) - u'(c_E)w_M = 0, \tag{9}$$

In (9), $\lambda = [\pi u'(c_E) + (1-\pi)u'(c_N)]\left[\xi + (1-\xi)w_M\right]$ since the benefit is received whether or not the worker is employed. Differentiating (9) and simplifying yields

$$-\frac{\partial H(w_M, t^*)}{\partial w_M} = u'(c_E)\left\{\frac{\pi u'(c_E)\left(1-\eta_N\right) + (1-\pi)u'(c_N)\left[1 - \mu\eta_E - (1-\mu)\eta_N\right]}{\pi u'(c_E) + (1-\pi)u'(c_N)}\right\} \tag{10}$$

where

$$\eta_E \equiv \frac{\partial c_E}{\partial w}\frac{w}{c_E} = \frac{(1-\xi)wb + (1-t)w}{[\xi + (1-\xi)w]b + (1-t)w}$$

is the elasticity of c_E with respect to w and

$$\eta_N \equiv \frac{\partial c_N}{\partial w}\frac{w}{c_N} = \frac{(1-\xi)w}{\xi + (1-\xi)w}$$

is the elasticity of c_N with respect to w. Observe that $1 > \eta_E > \eta_N \geq 0$ for $0 < \xi \leq 1$.

At $\mu = 1$, equation (10) simplifies to

$$-\frac{\partial H(w_M, t^*)}{\partial w_M} = u'(c_E)\left[\frac{\pi u'(c_E)\,(1-\eta_N) + (1-\pi)u'(c_N)\,(1-\eta_E)}{\pi u'(c_E) + (1-\pi)u'(c_N)}\right] > 0$$

since $1 > \eta_N$ and $1 > \eta_E$. By continuity, $-\partial H(w_M, t^*)/\partial w_M > 0$ for μ sufficiently close to one.

As $\mu \to \infty$, equation (10) implies that

$$-\frac{\partial H(w_M, t^*)}{\partial w} \to \left[\frac{(1-\pi)u'(c_N)u'(c_E)}{\pi u'(c_E) + (1-\pi)u'(c_N)}\right](\eta_N - \eta_E)\,\mu < 0$$

since $\eta_E > \eta_N$. Therefore, $-\partial H(w_M, t^*)/\partial w_M < 0$ for μ sufficiently large.

6 Appendix B: Data Sources

Unemployment support refers to unemployment insurance and active labor market policies. Other insurance refers to disability insurance, sickness pay, occupational illness and accidents, and survivor's insurance. Income replacement refers to unemployment support and other insurance. Family benefits refers to both cash benefits and spending on family services. Anti-poverty programs refers to spending on programs for the low-income, refugees and indigenous groups. Data is for 1985, 1990 and 1995 in the case of social insurance benefits and the rate of unemployment. All of the other variables represent the average value for the periods 1980-84, 1985-89 and 1990-94. The countries included in the data set are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, United Kingdom and the United

States. The missing data points are Belgium 1980-84, Portugal 1980-84 and Switzerland 1980-89. Country means are presented in Table 6.

Table 6 about here

The source for spending on social insurance, health care and pensions is OECD (1999). Data on Medicaid expenditures in the US is from the US Bureau of the Census (1990, 2001). Inequality (i/j) is $\ln(w_i/w_j)$, where w_k represents the wage or salary of a full-time employee at the kth percentile of the wage and salary distribution. The data on wage inequality is from OECD (1996) and, in the case of the US, OECD (1993). Conservative government is from the Swank data set (Swank 2002), updated using recent issues of Keesings Contemporary Archive. The classification of parties in terms of right versus center and left is based on Castles and Mair (1984) updated with Huber and Inglehart (1995). Turnout refers to turnout in elections in the lower house of parliament, or for president in the United States. The source for turnout is Blais and Dobryzynska (1998). The share of elderly in the population, and the rate of unemployment is from OECD (1997). The data set is available upon re quest.

7 Appendix C: Simulations

We generated 400 random data sets with the structure

$$\begin{aligned} y &= X\beta + u \\ E(u) &= 0 \\ E(uu') &= V \end{aligned}$$

where V is given by

$$V = \begin{pmatrix} \sigma_1^2 I & \sigma_{1,2} I & \dots & \sigma_{1,15} I \\ \sigma_{1,2} I & \sigma_2^2 I & \dots & \sigma_{2,15} I \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{1,15} I & \sigma_{2,15} I & \dots & \sigma_{15}^2 I \end{pmatrix}$$

The matrix X was a fixed 3x45 matrix (3 independent variables, 3 time periods, 15 countries) in which the first column was $(1, 1, \dots, 1)'$, the second column was the vector of lagged social insurance spending as a share of GDP and the third column was the data vector $Inequality(90/10)$.[24] We set $\beta = (5, .95, -2)'$. The components of the vector of error terms, u, were assumed to be normally distributed with the variance-covariance matrix $V = \Sigma \otimes I$ where Σ is a 15x15 cross-sectional variance-covariance matrix, and I is the 3x3 identity matrix. In each run, the diagonal elements of Σ were drawn from a uniform distribution with $\sigma_i^2 \in [0, 10]$. The off-diagonal elements, $\sigma_{i,j}$ $(i \neq j)$ were set equal to $\sigma_{ij} = \rho_{ij}\sigma_i\sigma_j$ where the correlation coefficients ρ_{ij} were also drawn from a uniform distribution. In the first 200 runs, we used the bounds $\rho_{ij} \in [-.2, .2]$. In a second 200 runs, we used the bounds $\rho_{ij} \in [0, .4]$. In both cases, we chose the bounds to be as wide as possible and still obtain a positive definite matrix most of the time. With each run that yielded a positive definite matrix, we calculated the 90 per cent confidence intervals for the OLS estimates, using both the OLS standard errors and the panel-corrected standard errors. The panel-corrected standard errors were calculated using the formula $E(bb') = (X'X)^{-1}(X'\widehat{V}X)(X'X)^{-1}$ where b represents the OLS estimates of β and $\widehat{V} = \widehat{\Sigma} \otimes I$. To calculate the components of $\widehat{\Sigma}$, we used the formula $\widehat{\sigma}_{ij} = (e_i'e_j)/3$ where e_i is the 3x1 vector of residuals for country i. The results are reported in Table 6

Table 7 about here

8 Endnotes

We thank the MacArthur Foundation and the Norwegian Research Council for financial support.

[1] For other recent books that emphasize the centrality of either the political mobilization or the economic organization of workers for explaining cross-national differences in the size of the welfare state, see Hicks (1999), Wilensky (2002) and Swank (2002).

[2] See Barr (1992) for a survey of the economic arguments in favor of public provision of insurance. Iversen and Cusack (2000) interpret the welfare state as insurance against the risk of income loss occasioned by the shift of jobs from manufacturing to the service sector while Rodrik (1998) and Garrett (1998) interpret the welfare state as insurance against the risks entailed by increased international economic integration. The redistributive insurance framework used in this paper was first presented in (self-reference).

[3] The strong correlation that exists between social insurance spending as a share of GDP and GDP per capita in data sets that include both high income and low income countries (as documented in Wilensky 1975), suggests that richer voters prefer to spend a larger share of income on social insurance. An alternative explanation is that the capacity of governments to collect revenues without imposing large deadweight costs rises with economic development.

[4] In contrast to these studies, Milanovic (2000) finds that more unequal countries redistribute in a sample that includes advanced industrial societies and the newly industrializing countries of East Asia, where redistribution is measured by the difference between the pre-tax and transfer Gini coefficient and the post-tax and transfer Gini coefficient. Since social insurance programs are not the only policies that redistribute income, studies of redistribution in general and studies of social insurance expenditures may arrive at different conclusions. Our purpose in this paper is to explain the pattern of social insurance expenditures, not to

explain the total amount redistribution that occurs.

[5] We discuss relaxing this assumption below.

[6] The assumption that μ is constant is made to simplify the mathematical expressions, but it is not necessary. The assumption that $\mu > 1$ is critical for our results. Both assumptions regarding μ are supported by studies of the allocation of household savings (Friend and Blume 1975).

[7] We have made the modelling choice to represent differences in social insurance policies in terms of differences in the distribution of benefits, rather than in terms of differences in the tax that finances the benefits. A more general approach would be to define after-tax and transfer income as a function of pre-tax and transfer income, as in Roemer (2003). For the purposes of this paper, however, the assumption of a flat tax is a reasonable approximation. In most of the countries we study, much of the welfare budget is financed by a payroll tax that is usually flat. (Denmark is an outlier in relying almost exclusively on income and value-added taxes.) Moreover, a recent study of the progressiveness of the personal income tax in 12 OECD countries found "no link between pre-tax inequality and the degree of redistribution brought about by the personal income tax" (Wagstaff et al, 1999: 83). Thus, in neglecting cross-national differences in the redistributive impact of the income tax, we do not appear to be neglecting a factor that is systematically related to pre-tax income inequality.

[8] The assumption that income replacement policies are redistributive, or that $\xi > 0$, is consistent with the way most social insurance programs are designed. For example, the average replacement ratio for unemployment insurance, $b_N(w,t)/w$ in the notation of the paper, is 18 per cent higher for a worker who receives 2/3 of the median wage than for a worker who receives the median wage in the countries in our data set (OECD, no date). Of course, it would be preferable if $\xi > 0$ was a conclusion rather than an assumption. However,

the one-dimensional model of politics no longer be applies when both ξ and b are chosen simultaneously. See Casamatta, Cremer and Pestieau (2000) for a model where ξ is chosen at a "constitutional" stage to maximize a social welfare function while $b(t)$ is chosen by self-interested voters in a second "electoral" stage.

[9] The US is exceptional in devoting roughly 25 per cent of public health expenditures to a family of means-tested programs known as Medicaid (US Bureau of the Census, 2001).

[10] See Aitchison and Brown (1957) for a discussion of the properties of the lognormal distribution and its use as an approximation of the distribution of income.

[11] The countries and years in the data set are listed in Appendix B.

[12] The regression equation is

$$y_t = 3.03 + \underset{(.050)}{.938}\, y_{t-1}$$

with $R^2 = 87.7$ and $n = 50$, where y_t is total welfare expenditures as a share of GDP in period t, and the parentheses under the coefficient contain the associated standard error.

[13] The possible endogeneity of unemployment is discussed below.

[14] The tripartite division of parties into left, center and right follows Castles and Mair (1984). Socialist, Social Democratic and Labor parties (with the exception of the Italian Social Democratic Party) comprise the group of left parties. Center Parties, Farmers Parties, Liberal parties in countries with a Conservative Party on the right, Christian Democratic parties in countries with a Liberal Party on the right and the Democratic Party in the US comprise the group of center parties. Conservative Parties, Liberal Parties in countries where the Liberal Party is the main party on the right and Christian Democratic Parties in countries where the Christian Democratic Party is the main party on the right, plus all small parties further right comprise the group of conservative parties.

[15] The impact of these three variables on the distribution of wages and salaries is analyzed

in Wallerstein (1999). For related studies, see Freeman (1988) and Blau and Kahn (1996) and Rueda and Pontusson (2000).

[16] The measure of union participation in policy making with respect to non-wage issues is described by Traxler, Blaschke and Kittel as "associational (union) participation in state regulation (non-wage issues)" (2001: 68, 312). The data is available by decade. We assigned the 1980-90 figure to 1985 in our data set, and the 1991-96 figure to 1995 in our data set. For 1990, we used the average of the 1980-90 and 1991-95 figures. We rechecked our results with1990 removed from our data. In neither case did the inclusion of the index of union participation alter our findings with respect to inequality.

[17] In the case of health expenditures, the estimated coefficient on inequality is even closer to zero if one subtracts means-tested health expenditures (Medicaid) from the US figures. Excluding US Medicaid expenditures (roughly 25 per cent of total government expenditures on health in the US), column 3 of Table 2 becomes

$$y_t = 2.92 + \underset{(.103)}{.801}\ y_{t-5} + \underset{(.526)}{.020}\ \text{Inequality} - \underset{(.0025)}{.0046}\ \text{Right} - \underset{(.0088)}{.0123}\ \text{Turnout} - \underset{(.052)}{.030}\ \text{Elderly}$$

with adjusted $R^2 = 65.8$. The standard errors are in the parentheses under the coefficients. Only the coefficient on the lagged dependent variable and on Right government are significant at the .05 level.

[18] The category of income replacement in Table 2 is a subset of the policies included in insurance against loss of income in Moene and Wallerstein (2001). The difference between the two is that the measure of insurance against income loss in Moene and Wallerstein (2001) includes a share of expenditures on health while all health expenditures are excluded from spending on income replacement in Table 2.

[19] An alternative way to measure the generosity of unemployment benefits is the replacement ratio, which is available from OECD (no date). Using the average replacement ratio for

a worker at the median wage and at 2/3 of the median wage in the first year of unemployment as the dependent variable yields

$$y_t = 3.81 + \underset{(.048)}{.864}\, y_{t-5} - \underset{(.054)}{.136}\ \text{Inequality} - \underset{(.0003)}{.0006}\ \text{Right} - \underset{(.0010)}{.0017}\ \text{Turnout}$$

with adjusted $R^2 = 90.5$. The standard errors are in the parentheses under the coefficients. All coefficients are significant at the .05 level. Neither the share of elderly in the population nor the rate of unemployment are significantly different from zero when the replacement ratio is the dependent variable.

[20] This procedure is advocated and given a Bayesian justification in Leamer (1978). We did not consider the unemployment rate to be "questionable" when the dependent variable included unemployment benefits.

[21] In lines (1), (4), (5) and (6), the minimum estimate is obtained by excluding Austria and the maximum estimate is obtained by excluding Finland. In line (2), the minimum is obtained by excluding Norway and the maximum is obtained by excluding the US. In line (3), the minimum is obtained by excluding Finland while the maximum is obtained by excluding Austria.

[22] Iversen and Soskice (2001: 889), for example, report a correlation coefficient of .73 between their measure of the extent of vocational training and the w_{10}/w_{90} ratio.

[23] Kenworthy (1999) calculates the share of individuals in advanced industrial societies who would be classified as living in poverty in the US, that is living in households with incomes less than 40 per cent of the median household income in the US after converting their household income to US dollars according to purchasing power parity and adjusting for family size. The partial correlation coefficient between share living in poverty and the log of the 90/10 wage ratio is .69, controlling for GDP per capita for the 14 countries where Kenworthy's sample overlaps the sample of this paper.

[24] For the simulation, we omitted Switzerland from the data set.

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TABLE 1: Summary Statistics				
Variable	Mean	S. D.	Minimum	Maximum
Total Welfare Spending/GDP	23.0	6.2	11.3	33.4
Pensions/GDP	6.9	2.2	3.0	11.0
Public Health Spending/GDP	6.0	0.9	4.3	8.1
Income Replacement/GDP	7.1	3.4	1.6	13.2
Unemployment Support/GDP	2.4	1.5	0.3	6.6
Other Insurance/GDP	4.7	2.3	1.2	9.6
Family Benefits/GDP	2.0	1.2	0.4	4.7
Anti-Poverty Programs/GDP	0.6	0.6	0	3.1
Housing Subsidies/GDP	0.3	0.4	0	1.9
Inequality (90/10)	1.06	0.25	0.68	1.70
Inequality (90/50)	0.55	0.12	0.38	0.88
Inequality (50/10)	0.51	0.16	0.27	0.89
Right Government	41.5	36.7	0	100
Turnout	78.5	13.2	40.0	95.6
Percent Elderly	13.5	2.1	9.5	17.7
Unemployment Rate	7.2	3.1	1.7	17.2
Notes: See Appendix B for data sources.				

TABLE 2. The Impact of Inequality on Major Categories of Welfare Spending as a Share of GDP in 18 OECD Countries, 1980-95

	1	2	3	4	5	6
Dependent Variable	All Welfare Spending	Pensions	Health	Income Replacement	Unemp. Insurance	Other Insurance
Lagged Dep. Var.	.749*** (.063)	.965*** (.056)	.777*** (.103)	.728*** (.065)	.582*** (.077)	.759*** (.064)
Inequality (90/10)	-4.50*** (1.50)	-0.31 (0.56)	0.17 (0.51)	-3.32*** (0.94)	-2.12*** (0.48)	-1.37** (0.63)
Right Govt.	-.0190*** (.0073)	-.0051** (.0028)	-.0047** (.0025)	-.0115*** (.0044)	-.0030 (.0026)	-.0070** (.0031)
Turnout	-.0730*** (.0250)	-.0177** (.0097)	-.0165** (.0085)	-.0343** (.0150)	-.0141* (.0086)	-.0182** (.0101)
Percent Elderly	.326** (.170)	.065 (.062)	-.020 (.052)	.116 (.090)		.116** (.063)
Unemp. Rate	.256*** (.082)			.122*** (.050	.163*** (.031)	-.016 (.032)
adj. R^2	92.3	90.7	61.2	90.4	82.5	90.7

Notes: OLS estimation, standard errors in parenthesis, $n = 50$, $^{***}p \leq .01$, $^{**}p \leq .05$, $^{*}p \leq .10$. All regressions include a constant.

Table 3: The Effect of Inequality on Expenditures
Robustness Tests

Dependent Variable	Extreme Bounds Analysis		Jackknife	
	Minimum	Maximum	Minimum	Maximum
1. All Welfare Spending	-5.52	-2.16	-6.90	-3.49
	(1.50)	(1.37)	(1.93)	(1.61)
2. Pensions	-0.75	0.32	-0.63	0.20
	(0.50)	(0.46)	(0.59)	(0.58)
3. Health	0.10	0.72	-0.01	0.50
	(0.52)	(0.44)	(0.55)	(0.63)
4. Income Replacement	-3.46	-1.93	-4.72	-2.54
	(0.99)	(0.85)	(1.19)	(0.96)
5. Unemployment Support	-1.83	-1.28	-2.50	-1.83
	(0.68)	(0.57)	(0.53))	(0.51)
6. Other Insurance	-1.71	-0.72	-1.79	-0.97
	(0.61)	(0.52)	(0.86)	(0.66)
n	50	50	47	47

Notes: Only the estimated coefficient for Inequality 90/10 is shown with standard errors in parentheses. Extreme Bounds Analysis summarizes the results of 2^q regression equations including all possible subsets of the q questionable controls. Jackknife summarizes the results of 18 regression equations excluding each country one at a time. The Jackknife estimates include the same controls as Table 2.

Table 4. The Impact of the 90/50 Ratio and the 50/10 Ratio on Welfare Expenditures as a Share of GDP

Dependent Variable	1 All Welfare Spending	2 Income Replacement	3 Unemployment Support	4 Other Insurance
Inequality 90/50	-4.91	-3.60	-1.47	-2.11
	(3.37)	(2.02)	(1.17)	(1.36)
Inequality 50/10	-4.19	-3.13	-2.48	-0.91
	(2.28)	(1.44)	(0.77)	(0.95)
$F(1, n-k)$	0.20	0.16	0.27	0.29

Notes: The regression equations include all of the controls included in Table 1 for each of the dependent variables, $n = 50, .k = 8$ for columns 1, 2 and 4, $k = 7$ for column 3. The F statistic tests the null hypothesis that the coefficients on Inequality 90/50 and Inequality 50/10 are identical.

TABLE 5. The Impact of Inequality on Smaller Categories of Welfare Spending as a Share of GDP in 18 OECD Countries, 1980-95

	1	2
Dependent Variable	Family Benefits	Anti-Poverty Programs and Housing Subsidies
Lagged Dependent Variable	.521*** (.102)	.986*** (.075)
Inequality (90/10)	-0.45 (0.63)	-0.24 (0.26)
Right Government	-.0025 (.0029)	.0028** (.0013)
Turnout	.0150* (.0101)	-.0036 (.0044)
Percent Elderly	.068 (.061)	.024 (.025)
Unemployment Rate	.035 (.032)	.048*** (.014)
adj. R^2	63.8	82.7

Notes: OLS estimation, standard errors in parenthesis, $n = 50$, $^{***}p \leq .01$, $^{**}p \leq .05$, $^{*}p \leq .10$. All regressions include a constant.

Table 6: Country Means for the Main Categories of Social Insurance Spending as per cent of GDP, 1985-95

Country	Total	P	H	IR	US	OI	F	AP&H
Australia	14.7	3.1	5.6	3.8	1.8	2.0	1.8	0.5
Austria	25.9	9.8	5.4	7.7	1.4	6.2	2.6	0.4
Belgium	27.7	7.9	6.8	10.0	4.0	6.0	2.3	0.5
Canada	17.4	3.9	6.5	3.7	2.3	1.4	0.7	2.6
Denmark	29.0	6.7	5.3	11.8	5.8	6.0	3.4	1.7
Finland	26.9	7.0	6.0	9.8	3.0	4.8	3.4	0.7
France	27.9	9.5	7.0	7.7	3.0	6.4	2.6	1.1
Germany	26.9	10.0	7.3	7.0	2.7	4.3	1.9	0.7
Italy	22.8	9.9	5.7	6.5	1.8	4.7	0.7	0.0
Japan	12.3	4.9	5.0	1.8	0.4	1.4	0.4	0.2
Netherlands	28.8	7.1	6.2	12.6	4.0	8.6	1.8	1.2
NZ	19.5	6.8	5.2	4.7	2.0	2.7	2.4	0.5
Norway	25.2	5.5	6.3	9.6	1.9	7.7	2.8	1.0
Portugal	16.6	5.3	4.6	5.6	1.4	4.2	1.0	0.1
Sweden	32.2	7.7	7.3	11.3	3.5	7.8	4.3	1.6
Switzerland	25.2	10.1	6.6	6.1	1.6	4.5	1.1	1.3
UK	21.2	6.3	5.2	5.6	1.7	3.9	2.2	1.9
US	14.6	5.2	5.4	3.0	0.6	2.4	0.6	0.5
mean	23.0	6.9	6.0	7.1	2.4	4.7	2.0	0.9

Notes: P refers to pensions; H refers to health; IR refers to income replacement, which equals US + OI; US refers to unemployment support (unemployment insurance plus active labor market policies); OI refers to other insurance (disability, sickness pay, occupational injury and other similar programs); F refers to family benefits and services; AP&H refers to anti-poverty programs and housing. See text for further details.

Table 7. The Percentage of 90 per cent Confidence Intervals that Missed the True Value of the Regression Coefficient		
	1 $\rho_{ij} \in [-.2, .2]$	2 $\rho_{ij} \in [0, .4]$
Number of Simulations	200	200
OLS Standard Errors	9.3	10.5
Panel-Corrected Standard Errors	24.0	23.0
Notes: The simulations were based on the model $y = X\beta + u$ with 15 countries, 3 time periods and 3 fixed regressors where u is a vector of normally distributed random variables with $E(u) = 0$ and $E(uu') = \Sigma \otimes I_3$ as described in the text.		