The Altruistic Rich? Inequality and Other-Regarding Preferences for Redistribution in the US

Matthew Dimick  
SUNY Buffalo Law School  
mdimick@buffalo.edu

David Rueda  
Department of Politics & IR and Nuffield College, University of Oxford  
david.rueda@politics.ox.ac.uk

Daniel Stegmueller  
Department of Government, University of Essex  
mail@daniel-stegmueller.com

Abstract

Why is the difference in redistribution preferences between the rich and the poor high in some places and low in others? In this paper we argue that it has a lot to do with the rich and very little to do with the poor. We contend that while there is a general relative income effect on redistribution preferences, the preferences of the rich are highly dependent on the macro-level of inequality. The reason for this effect is not related to immediate tax and transfer considerations but to other-regarding concerns. Altruism is an important omitted variable in much of the Political Economy literature. While material self-interest is the base of most approaches to redistribution (first affecting preferences and then politics and policy), there is a paucity of research on other-regarding concerns. Using data for the US from 1978 to 2010, we show that the rich in more unequal states are more supportive of redistribution than the rich in more equal states. In making these distinctions between the poor and the rich, the arguments in this paper challenge some influential approaches to the politics of inequality.
1. Introduction

The relationship between income inequality and redistribution preferences is a hotly contested topic in the literature on the comparative political economy of industrialized democracies. While some authors maintain that the poor have higher redistribution preferences than the rich (Finseraas 2009; Shayo 2009; Page and Jacobs 2009), others argue that there may not be a negative association between income and redistribution (Moene and Wallerstein 2001; Fehr and Schmidt 2006; Alesina and Glaeser 2004: 57-60).

If we were to look at the preferences of rich and poor in different states in the US, as we do below, we would observe very significant differences in how apart the rich are from the poor regarding their favored levels of redistribution. These important differences in support for redistribution have received little attention in the existing scholarship and yet they are a most significant element in explanations of outcomes as diverse (and as important) as the generosity of the welfare state, political polarization, varieties of capitalism, etc.

In this paper we show that even after accounting for material self-interest, there is still a great degree of variation in redistribution preferences. We argue that this variation has more to do with the preferences of the rich than those of the poor, and that they can be explained by taking into account the relationship between macro-inequality and altruism. Using American survey data, we present a set of empirical tests that support our hypotheses (and provide limited evidence in favor of alternative explanations).

Our argument can be summarized very simply. We propose a model of other-regarding motives, which we term “income-dependent altruism.” Our initial intuition is that, with diminishing marginal utility of consumption, a poor person values an additional dollar worth of consumption more than a rich person. A transfer of a dollar from a rich person to a poor person increases the utility of a poor person more than it decreases the utility of a rich person, thus increasing aggregate social welfare. We then argue that altruism raises the income threshold for those who favor at least some amount of redistribution. We therefore propose that individuals have two different concerns: they care about their own welfare, but also about the welfare of others. Because they are partly self interested, the amount of redistribution individuals prefer still decreases as their income increases, as with purely self-interested individuals. However, because they are also altruistic, the rate of decrease is smaller than that of individuals who care only about their own welfare. As a consequence of the above, an individual’s demand for redistribution will increase
as inequality increases, but this effect will be larger for richer individuals than for poorer individuals. The non-intuitive implication of our argument, therefore, is that the rich in more unequal places will support redistribution more than the rich in more equal places. The poor’s support for redistribution will be less affected by macro inequality.

Our arguments challenge some influential approaches to the politics of inequality. These include other versions of the nature of other-regarding preferences, like the “inequity aversion” preferences proposed by Fehr and Schmidt (1999) or the “fairness” preferences analyzed by Alesina and Angeletos (2005), those emphasizing insurance concerns (see, for example, Alt and Iversen 2013), and those focusing on empathy as a consequence of income skew (Lupu and Pontusson 2011). We will elaborate on our differences from these approaches in the pages that follow, but we should clarify first how we approach the topic of other-regarding preferences.

The possibility that other-regarding concerns influence redistribution preferences has received increasing amounts of attention in the recent political economy literature. There is neural evidence that individuals have a dislike for unequal distributions, independent from social image or potential reciprocity motivations. Tri-comi et al. (2010) use functional magnetic resonance imaging to test directly for the presence of inequality-averse social preferences in the human brain. In laboratory experiments, individuals have been shown to have concerns for the welfare of others (see, for example, Charness and Rabin 2002, and Fehr and Gächter 2000). A number of alternative models have been presented to analyze different kinds of other-regarding concerns (for reviews, see and DellaVigna 2009). As we will document below, support for redistribution is widespread in the US and extends into income groups whose support for redistribution could not possibly be motivated by short-term income maximization. Altruism constitutes one plausible reason why affluent individuals might support redistribution even though its effect is to reduce their disposable income and their share of total income. But “altruism is not an unpredictable ‘social noise’ to be randomly sprinkled over individuals” (Alesina and Giuliano 2011: 94). Altruistic concerns need to be systematized into predictable hypotheses. We follow Alesina and Giuliano (2011: 94) in arguing that “standard neoclassical general equilibrium theory can accommodate altruism, i.e., a situation in which one agent cares also about the utility of somebody else.”

There are two ways of thinking about altruism or other-regarding preferences in the political economy literature. The first approach takes its inspiration from work in psychology. There is a significant literature on altruism as a personality
This research has often taken the form of a self-reported measure (the Self-Report Altruism, SRA, Scale) aggregating different items capturing an individual’s engagement in altruistic behaviours (pushing a stranger’s car out of the snow, giving money to a charity, etc).

The second one understands other-regarding concerns to be affected by a “situational” logic. Inequity aversion (as described above) is one of the most common expressions of this approach. In these arguments, other-regarding preferences are inevitably linked to macro levels of inequality. When altruism is significant, as the allocation of material payoffs become more equitable, the utility of individuals increases (see, for example, Fehr and Gächter, 2000).

While we accept that the role of altruism as personality trait in determining redistribution preferences is an important one, we emphasize a situational approach in this paper. We will show that it is very useful to argue that individual preferences for redistribution are affected by social welfare. We agree that, for many economic outcomes, personality measures are as predictive as cognitive ones (see, for example, Almlund et al., 2011) but find this compatible with our main argument. It is certainly possible that there are some individuals that have more altruistic personalities than others. But, as we will show in the next section, this would not affect the general implications of our argument about the relationship between redistribution preferences and macro levels of inequality.

2. A Model of Altruistic Preferences for Redistribution

This section introduces our proposed model for understanding the relationship between self-interest, other-regarding behavior, and preferences for redistribution, which we call “income-dependent altruism.” We then demonstrate the distinctiveness of our results by contrasting the model with several other prominent models of redistributive preferences.

Income, Redistribution, and Budgets

Let there be a set of $n$ individuals, indexed by $i$, $i \in \{1, 2, \ldots, n\}$. Individuals are distinguished by their gross income level, $y$. Thus, the gross income of the $i$th individual is given by $y_i$, where $0 \leq y_i < y_j \leq \infty$ for $i < j$. Average income is then

---

1 See, for example, the research on altruistic personality by Rushton et al. (1981).
defined as
\[ \bar{y} = \frac{1}{n} \sum_{i=1}^{n} y_i \tag{1} \]

The government operates a linear tax, \( \tau, \tau \in [0, 1] \), and distributes the proceeds to all citizens in equal lump-sum transfers, \( T \). The size of the transfer is determined by government revenue, \( \tau \bar{y} \), less the costs of taxation \( \phi(\tau)\bar{y} \). To keep the model as simple as possible, we assume that \( \phi(\tau) = \frac{1}{2} \tau^2 \). The government's budget is balanced, so
\[ T = \left( \tau - \frac{1}{2} \tau^2 \right) \bar{y}. \tag{2} \]

With taxes and transfers, each agent's budget constraint, equivalently her consumption or disposable income, is then given by:
\[ c_i = (1 - \tau)y_i + T \tag{3} \]

**Preferences**

Individuals have a separable utility function consisting of both their own utility (or self-interested utility), \( u(c_i) \), which is defined over each person’s disposable income \( c_i \), and other-regarding utility, \( \Omega \), parameterized by \( \delta \):
\[ V[u(c_i), \Omega] = u(c_i) + \delta \Omega \tag{4} \]

It would be perfectly plausible to allow the parameter \( \delta \) to vary across different individual types—altruistic versus non-altruistic—in which case we would write \( \delta_i \). However, not allowing \( \delta \) to vary makes clear that our results, in particular the relationship between income and inequality, do not depend on such variation.

For the agent’s own utility, we impose the following standard restrictions on \( u \):
\[ u'(c) > 0, \]
\[ u''(c) < 0, \quad \text{and} \]
\[ \lim_{c \to 0} u'(c) = \infty, \tag{5} \]

In addition, in certain cases it will be either convenient or necessary to adopt a specific form for these assumptions:
\[ u(c) = \begin{cases} 
  c^{1-\epsilon}, & \text{for } \epsilon \in [0, 1) \cup (1, \infty) \\
  \log c, & \text{for } \epsilon = 1.
\end{cases} \tag{6} \]
One implication of this specification is that $u$ exhibits the Arrow-Pratt measure of constant relative risk aversion (CRRA; \cite{Pratt1964}): $R(c) = -cu''(c)/u'(c)$.

As for other-regarding preferences, we assume that they take the form of a standard social welfare function:

$$
\Omega = \frac{1}{n} \sum_{j=1}^{n} u(c_j)
$$

which is simply the average of all individuals’ utility. We explicate and explore the implications of these assumptions in the following section.

### 3. Model Results

#### 3.1. Implications of the Model

A critical implication of the social-welfare function is that it directly reflects levels of income inequality, which is made explicit by the following lemma. To begin, we adopt a welfare-based measure of inequality, termed the Atkinson Index \cite{Atkinson1970} and denoted by $Q$. Assuming the specification for constant relative risk aversion in equation (6), the Atkinson Index defines inequality for $Q \in [0, 1]$ and is given by:

$$
Q(\tau; c_1, c_2, \ldots, c_n) = \begin{cases} 
1 - \frac{1}{\bar{c}} \left( \frac{1}{n} \sum_{i=1}^{n} c_i^{1-\epsilon} \right)^{1/(1-\epsilon)}, & \text{for}\ \epsilon > 0 \land \epsilon \neq 1 \\
1 - \frac{1}{\bar{c}} \left( \prod_{i=1}^{n} c_i \right)^{1/n}, & \text{for}\ \epsilon = 1 
\end{cases}
$$

where $\bar{c}$ denotes average disposable income. Next, as the following lemma demonstrates, social welfare and inequality, as defined by the Atkinson Index, are related in a fundamental way.

**Lemma 1 (Social welfare and inequality.)** The social welfare function can be expressed in terms of both mean income, $\bar{c}$ and inequality, $Q$, as defined by the Atkinson Index:

$$
\Omega = u[\bar{c}(1 - Q)] = u(c_{\bar{c}})
$$

where $\bar{c}(1 - Q)$ is the abbreviated social welfare function and $c_{\bar{c}}$ is described as equally distributed equivalent income.

**Proof.** See Appendix A.1.
The lemma demonstrates that the social welfare function can be expressed directly in terms of inequality. This is important for three reasons. First, it shows that the social welfare function is also a measure of inequality. Further, it dictates our choice of the measure of inequality we use in our empirical analysis, which is the Atkinson Index. Finally, the identity with the utility of equally distributed equivalent income serves a more technical purpose, which is explained in the proof to the lemma.

The basis behind this identity of the social welfare function and inequality is straightforward. Although social welfare is simply an aggregate of all individuals’ utility, because utility functions are concave—that is, individuals have diminishing marginal utility of consumption—the social welfare function also exhibits inequality aversion. In other words, because the rich value an additional dollar of consumption less than the poor, transferring a dollar from the poor to the rich—that is, increasing the level of inequality—reduces social welfare. By the same token, transferring a dollar from the rich to the poor increases social welfare. Hence, the expression $\bar{c}(1-Q)$ captures the idea that as inequality increases social welfare decreases; slightly more formally, a larger $Q$ implies a smaller $\bar{c}(1-Q)$, which is equivalent to a reduction in $\Omega$.

Before proceeding, we pause to acknowledge that whose social welfare or which inequality is considered by an individual is an open theoretical question. We can think of compelling reasons for why individuals would be concerned about national level inequality (e.g., if redistribution occurs primarily through national institutions), regional/state and local levels of inequality (e.g., salience, proximity, or information), or all of them together. To anticipate our empirical analysis, to fully exploit the available data we will construe the social-welfare function as being composed of state-level incomes and utility functions, even though self-interested preferences (as well as the administration of tax and transfer programs) are oriented toward the national level. This decision changes none of the theoretical insights we describe below.

We now investigate the implications of our conception of altruism for individuals’ preferences for redistribution. We begin by stating our basic proposition:

**Proposition 1 (Income-dependent altruism.)** The model of altruistic preferences given by equation [4] has the following properties:

(A) For $y_i \geq \hat{y}$, the level of redistribution preferred by individual $i$, denoted $\tau_i^*$, is $\tau_i^* = 0$. For $y_i < \hat{y}$, the preferred level of redistribution satisfies $0 < \tau_i^* < 1$. Furthermore, we note that $\hat{y} > \check{y}$: the income threshold for preferring some positive
amount of redistribution is greater than mean income.

(B) An individual $i$’s preferred level of redistribution $\tau^*_i$ is decreasing in individual income $y_i$. Formally, $\frac{\partial \tau^*_i}{\partial y_i} < 0$.

(C) An individual $i$’s preferred level of redistribution $\tau^*_i$ is increasing in inequality $Q$. Formally, $\frac{\partial \tau^*_i}{\partial Q} > 0$.

(D) The effect of an increase of inequality $Q$ on an individual $i$’s preferred level of redistribution $\tau^*_i$ is increasing in individual income $y_i$. Formally, $\frac{\partial^2 \tau^*_i}{\partial Q \partial y_i} > 0$.

The intuition behind each of these results is as follows. Part (A) of the proposition, closely related to Part (B), says that there is some income threshold above which an individual prefers no redistribution and below which an individual prefers some positive amount of redistribution. This threshold also exists in the standard, self-interested model of redistributive preferences. However, the critical difference in our model is that this threshold is strictly above the income threshold that would obtain with purely self-interested individuals. This result follows directly from our altruistic model of preferences. Because individuals care about the welfare of others, relatively affluent individuals are willing to support more redistribution than they would if they were merely self-interested.

Nevertheless, as Part (B) asserts, the level of redistribution preferred by an individual is still decreasing in her income. This is because individuals have mixed motives: although they care about inequality and social welfare, they care about the impact that redistributive policies have on their own welfare as well. Accordingly, richer individuals support less redistribution than poorer individuals.

Part (C) of Proposition 1 says that an increase in inequality will increase an individual’s demand for redistribution. This result follows from the effect of an increase in inequality on social welfare and individuals’ other-regarding preferences. Because inequality decreases social welfare, it also lowers individuals’ utility, via their other-regarding concerns. Thus, by increasing redistribution, individuals can reduce inequality and increase social welfare.

The final part of this proposition is the most important statement we derive from our model of altruistic preferences for redistribution. Even though the rich prefer less redistribution than the poor, Part (D) says that an increase in inequality will lead to a relatively larger increase in support for redistribution for among rich than among the poor. Although perhaps counterintuitive at first, it can be simply understood within our basic conception of altruistic preferences. As we have seen, the assumption of a concave utility function plays a crucial role in shaping inequality
aversion with respect to the other-regarding portion of an individual’s preferences. But it also plays an important role in individuals’ own self-interested preferences for consumption over redistribution. Although a rich person prefers less redistribution than a poor person for self-interested reasons, an increase in inequality increases her demand for redistribution more than a poor person. This is because she values an additional dollar of consumption less than does a poor person. She would therefore rather spend more of that dollar on redistribution than on personal consumption. In contrast, when inequality increases, a poor person, who already favors more redistribution for self-interested reasons, values an additional dollar of consumption more and would rather spend more of that dollar on personal consumption than on alleviating inequality. Thus, at the margin a richer individual is willing to trade more consumption for redistribution even though overall she prefers less redistribution than a poor person.

3.2. Distinguishing the Model

We are of course not the first to suggest that other-regarding concerns play a role in support for redistribution. In this section, we distinguish the implications of our model from alternative models. Because our model highlights the other-regarding consequences of economic inequality, we focus on those models with similar features. These include both Fehr and Schmidt’s (1999) model of “reference-dependent inequity aversion” and Alesina and Angeletos’s (2005) model of “fairness” preferences. The inequity-aversion preferences of Fehr and Schmidt have been widely cited and are based on extensive experimental evidence. By distinguishing between “fair” and “unfair” inequalities, the argument by Alesina and Angeletos accords with the popular notion that only inequalities in opportunities, rather than outcomes, deserve to be corrected. Furthermore, it provides an intuitive and compelling resolution of the puzzling macro-comparative finding (the so-called “Robin Hood” paradox) that redistribution is higher when inequality is lower—i.e., where there appears to be less need for redistribution.

In Fehr and Schmidt’s conception, an individual evaluates inequality differently depending on her income relative to others. Inequality of incomes that is greater than the income of a given individual is termed “disadvantageous inequality” or envy. Inequality of incomes that is below the income of an individual is called “ad-

\[^2\text{Thus, we do not directly address “social distance” models (e.g., Lupu and Pontusson 2011; Shayo 2009), which highlight the limits of other-regardingness, or models such as “last-place aversion” preferences (Kuziemko et al. 2014), which make predictions about the effects of inequality on only a smaller subset of the population.}^2\]
vantageous inequality” or altruism. The critical restriction that Fehr in Schmidt place on their version of other-regarding preferences is that concern about advantageous inequality is weighted less than concern about disadvantageous inequality. Alternatively, one could say that individuals are more envious than they are altruistic.

This assumption has important implications for redistributive preferences. Similar to altruistic preferences, the inclusion of other-regarding utility raises the income threshold of the person who favors the least, but some positive, amount of redistribution. Whether advantaged or disadvantaged by inequality, any amount of inequality comes at a cost to individuals’ other-regarding utility. Thus, the existence of any amount of inequality increases an individuals demand for redistribution relative to their purely self-interested preferences. However, in the case of inequity aversion, poorer individuals have a stronger reaction to changes in inequality than richer individuals (which is opposite from the case of altruistic preferences). The reason for this is precisely because of Fehr and Schmidt’s assumption that individuals are more envious than altruistic. When envy dominates altruism, any increase in inequality that changes a person’s relative position—by making a richer person richer and a poorer person poorer—will increase her demand for redistribution. Even if the change in income between the richer and poorer person is identical, there is a net negative effect on her other-regarding utility because a person is more concerned about disadvantageous inequality than advantageous inequality. Furthermore, simply by dint of the fact that poorer individuals have less income, poorer individuals are more likely to be disadvantaged in this way by an increase in inequality. Thus, an increase in inequality will tend to increase the demand for redistribution from the poor more than from the rich.

The arguments in Alesina and Angeletos (2005), are based on the idea that individuals have both “earned” or “fair” income as well as “uneearned” or “unfair” income, and that only “unfair” income comes at a utility cost to individuals. Thus, inequality of final outcomes is not of concern to individuals, and they may tolerate a high degree of inequality, provided that it is “fair.” As before, altruism or inequity aversion increases the income level of the person who wants at least some amount of redistribution. However, in the case of fairness preferences, other-regarding utility has an indeterminate impact on this threshold. This is because individuals want to reduce only unfair inequality—that is, differences in income resulting from, say, luck, rather than effort. Indeed, any attempt to redistribute inequalities that are generated fairly impose a utility cost on individuals’ fairness preferences. Thus, if the extent of inequality created by unearned income was extremely small, both rich and even poor individuals would prefer less redistribution than if they were only self-interested.
Nevertheless, also note that as in the previous models, an individual’s demand for redistribution is decreasing in her income, for the identical, self-interested reasons.

More importantly, while individuals are willing to correct for luck income, it is not always clear how much of an individual’s income is a result of effort rather than luck. If inequality is driven primarily by differences in returns to talent or ability (and therefore earned), then greater inequality implies that large differences in income are more likely a product of effort rather than luck. Conversely, when inequality is low, it becomes more likely that inequality is a product of arbitrary luck, rather than effort. Since individuals with fairness concerns want to correct for luck income rather than earned income, they will favor more redistribution when inequality is low than when it is high. Thus, an increase in inequality will lower an individual’s preferred level of redistribution (the opposite implication from the one proposed in this paper).

Figure 1 illustrates four different models of preferences—pure self-interest, inequity aversion, income-dependent altruism, and fairness, in clockwise order from top-left—and the distinct patterns of income, inequality, and preferences for redistribution they imply.

Getting similarities out of the way first, we can observe that in all cases the level
of redistribution preferred by an individual is decreasing in her income. This reflects the fact that in all other-regarding models individuals have mixed motives: although agents may be other-regarding, they care for their own interests as well. Note also that in all of the other-regarding models, concern about inequality increases the income domain over which individuals prefer at least some positive amount of redistribution. When individuals are purely self interested, no one above mean income prefers any level of redistribution. When individuals have other-regarding concerns, at least some with income above the mean prefer some redistribution. This is the result of other-regardingness in action: concern about others’ welfare leads individuals to favor more redistribution than if they were purely self interested.

Turning now to differences, the first observation to make is the way that a mean-preserving increase in inequality changes preferences for redistribution. Such a change has an effect in all of the other-regarding preferences, but not self-interested preferences. A mean-preserving change in inequality makes no difference to self-interested persons with the same income under either distribution. For both inequity aversion and income-dependent altruism, an increase in inequality increases the demand for redistribution for individuals of all income types. This is because both kinds of preferences exhibit inequality aversion: inequality in any form comes at a cost to other-regarding utility. In contrast, an increase in inequality lowers the demand for redistribution with fairness preferences. This is because fairness preferences are concerned only about unearned or unfair inequality, in contrast to earned or fair inequality. With fairness preferences, when inequality is high (low), differences in income are less (more) likely the product of luck, and therefore there is less (more) of a desire to reduce actual inequality.

The second major observation is how an increase in inequality affects individuals at different points in the income scale. For inequity-aversion preferences, an increase in inequality increases the demand for redistribution, but this effect decreases as income increases. This is because individuals care more about what Fehr and Schmidt call disadvantageous inequality (or, envy) than about advantageous inequality (or, altruism). In their conception, individuals weight more heavily differences in income between themselves and richer individuals than they do differences in income between themselves and poorer individuals. Thus, the poor weight more heavily an increase in inequality than the rich, which leads to a larger increase in demand for

---

3Note that in all cases mean income is not substantively important. Depending on parameters, this reference point could take on several possible values. The important observation to make is the difference that other-regarding concerns make to the threshold condition, relative to self-interested preferences.
redistribution from the poor.

In summary, the predictions of income-dependent altruism are quite different from those of inequity-aversion or fairness preferences. Unlike fairness preferences, but like inequity aversion, an increase in inequality increases the demand for redistribution. And unlike both fairness and inequity-aversion preferences, the effect of an increase in inequality is larger for the rich than the poor. Finally, the results we give for the interaction effects between income and inequality with both the fairness and inequity-aversion preferences have not, to our knowledge, been established in the literature. We therefore provide formal proofs of these conclusions in the online appendix.

It is finally necessary to contrast our model with another important approach to social-policy preferences, namely the “insurance model.” Although not a model with other-regarding preferences, both the insurance model and the one presented in this paper have similar foundations. Indeed, it is a well-known economic result that the strict concavity of a utility function implies both risk aversion as well as inequality aversion (Mas-Colell et al. 1995: 826). Moreover, in a recent paper, Alt and Iversen (2013) argue that a model of altruism incorporating “social distance” and an insurance model with segmented labor markets yield substantively identical conclusions. Nevertheless, income-dependent altruism retains some implications that are distinct from the social insurance model. This is mainly because in our altruism model inequality directly affects individuals’ utility but also because it does not feature a social distance parameter. Consequently, while the thrust of the model analyzed by Alt and Iversen is that increases in inequality will reduce demand for redistributive social insurance, our argument is precisely the opposite, namely, that a rise in inequality will lead individuals to favor more redistribution.

Before beginning the empirical analysis, we also wish to pause to emphasize that the purpose of this exercise is not to adjudicate between our model and other models of redistributive preferences. Rather, our burden is simply to demonstrate that the model of income-dependent altruism carries distinctive implications. Income-dependent altruism may well be compatible with some of the implications of alternative models we discuss in this section, and the influence of inequality on individual preferences may occur through several channels. But these issues are best left for future research to explore.
4. Testing the model

We take our statistical specification from our theoretical model. From the first order condition of individual $i$’s utility function in (4) we derive the theoretical function $\tau^*_i(y_i, Q)$, which represents $i$’s preferred level of redistribution, $\tau^*_i$, given $i$’s income, $y_i$, and the level of inequality, $Q$. To obtain a linear-in-parameters estimating equation, we take the first-order Taylor expansion of $\tau^*_i(y_i, Q)$, which is given by

$$\tau^*_i = x + \frac{\partial \tau^*_i}{\partial y_i} y_i + \frac{\partial \tau^*_i}{\partial Q} Q + \frac{\partial^2 \tau^*_i}{\partial Q \partial y_i} Q y_i.$$  \hspace{1cm} (10)

Thus our regressions take the form

$$R_i = x + b y_i + c Q + d Q y_i,$$  \hspace{1cm} (11)

where $R_i$ is an individual’s measured level of redistribution preference. If our estimate of $b$ is significantly (in the statistical and substantive sense) smaller than zero, we can infer that $\frac{\partial \tau^*_i}{\partial y_i} < 0$ and confirm part (B) of proposition 1. If our estimate of $c$ is significantly larger than zero, we infer that $\frac{\partial \tau^*_i}{\partial Q} > 0$ confirming part (C). Finally, in testing our central hypothesis, if our estimate of $d$ is significantly larger than zero, we show that $\frac{\partial^2 \tau^*_i}{\partial Q \partial y_i} > 0$ and confirm part (D) of proposition 1.

4.1. Statistical specification

We test the model using repeated cross-sections of the General Social survey (described below). Thus, let $R_{ist}$ be the stated redistribution support of individual $i$ ($i = 1, \ldots, N_{st}$) in state $s$ ($s = 1, \ldots, S$) at time $t$ ($t = 1, \ldots, T$). Observed survey responses are distinct from preferences. We thus use a latent variable setup, where observed responses are generated by an underlying continuous latent preference variable $R^*_{ist}$. Since we are interested in the effect of changes in inequality, we opt for a specification which includes state-specific constants, $\xi_s$, as well as common time shocks, $\lambda_t$. Due to the nature of our repeated cross-section survey data, some states have fewer observations per time-point than others. To overcome this limitation, we specify a hierarchical model for state-specific effects, to yield shrinkage estimates for preferences (Jiang 2007; Rabe-Hesketh and Skrondal 2008). This
leads us to estimate the following hierarchical probit specification:

\[ R_{ist} = 1(R_{ist}^* > 0) \]  
\[ R_{ist}^* = \beta' x_{ist} + \gamma_1 y_{ist} + \gamma_2 Q_{st} + \gamma_3 Q_{st} y_{ist} + \lambda_t + \xi_s + \epsilon_{ist} \]

The effect of our variables of interest is captured by the three \( \gamma \) coefficients, which capture the role of income distance, \( y_{ist} \), the direct effect of inequality in state \( s \) in year \( t \), \( Q_{st} \), and the effect of inequality conditional on income, \( Q_{st} \cdot y_{ist} \). We include a number of individual and state-level conditional controls as well as an intercept in \( x_{ijt} \) with associated effects estimates \( \beta \). Residuals \( \epsilon \) are distributed normal with unit variance.

As discussed above, our state-specific effects follow a hierarchical specification, i.e., we specify them as draws from normal distributions centered at zero with variance parameters \( \psi^2 \) estimated from the data,

\[ \xi_s \sim N(0, \psi^2), \quad s = 1, \ldots, S \]

We estimate this model using maximum likelihood and integrate over the random state effects distribution using adaptive Gaussian quadrature with 15 integration points (Rabe-Hesketh et al. 2005).

We investigate the robustness of our modeling choices in three ways. First, we also estimate a specification where states are fixed effects as well as a linear probability model with state and time fixed effects (on \( R_i \) instead of \( R_{ist}^* \)). Second, we conduct a robustness check where we estimate the model in a Bayesian framework using nonparametric density estimation for state- and time-specific effects.

5. Data

We test the parameters outlined above by using a panel of repeated individual level surveys. The General Social Survey (GSS) covers more than thirty years and contains measures for individual income and preferences. It therefore has figured prominently in studies of redistribution preferences (e.g., Alesina and Angeletos 2005; Alesina and Giuliano 2011). Our theoretical argument proposes that the importance of inequality emerges from its relationship to altruism. This implies that the relevant level of macro inequality should be one at which a visible connection to the need of the poor (and the moral benefits of generosity) could be made by individ-

\[ ^4 \text{Thus, } \gamma_1 \text{ corresponds to } b \text{ in eq. (11), } \gamma_2 \text{ to } c, \text{ and } \gamma_3 \text{ to } d. \]
uals. We therefore move away from national data and use state levels of inequality matched to the GSS.

We select GSS data starting in 1978 (where redistribution preference measures become available) and ending in 2010. We limit our population to working-age (20-65) individuals who are not currently in full-time education. These restrictions yields 21,704 observations. After removing individuals with missing values on co-variates we are left with 19,025 individuals.\footnote{We conducted a robustness test showing that using multiple imputation yields substantively indistinguishable results (see Section 7).}

**Preferences** We capture redistribution preferences using a commonly used measure (e.g.,\cite{ale05}), available over time in the GSS. It presents respondents with the following statement: “the government should reduce income differences between the rich and the poor, perhaps by raising the taxes of wealthy families or by giving income assistance to the poor”. Answers are recorded on a seven point scale, with labeled endpoints “1=should” and “7=should not”, which we reverse for ease of interpretation. Table 1 shows the distribution of responses in our sample. It is immediately apparent that preferences regarding redistribution are polarized: a relatively large number of responses are concentrated at both extremes of the scale. As much as 16\% of the individuals in a survey declare the the government should reduce income differences, while as much as 24\% declare that it should not. For our model we create an indicator variable which is equal to one if a respondent indicates clear support of redistribution by choosing the highest or second highest answer category. The distribution of this variable is given in Table 1.

It makes clear that there has been variation over time, both in terms of the original variable and of the binary support indicator. But we must remember that these are aggregate numbers (and do not necessarily reflect the within-state variation to be emphasized below).

**Inequality** Our model conceptualizes inequality via the Atkinson index (see equation 8). We directly translate this into an empirical measure, by calculating state-level Atkinson indexes for each year, denoted $Q_{jt}$, with its inequality sensitivity parameter $\epsilon$ set to 0.5 (\cite{atk70}; \cite{cow00}). The basis for our calculations is tax return data from the Internal Revenue Service. This is preferable to survey based calculations, as argued in detail by \cite{atk01}. Not only are the very rich underrepresented in standard surveys, in order to protect respondents’ anonymity, incomes are usually top-coded. Consequently, the extent of inequality tends to be
Table 1: Distribution of redistribution preferences, 1978-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>No 1</th>
<th>No 2</th>
<th>No 3</th>
<th>No 4</th>
<th>No 5</th>
<th>No 6</th>
<th>No 7</th>
<th>Yes 1</th>
<th>Yes 2</th>
<th>Yes 3</th>
<th>Yes 4</th>
<th>Yes 5</th>
<th>Yes 6</th>
<th>Yes 7</th>
<th>Support Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>12.3</td>
<td>8.7</td>
<td>12.1</td>
<td>21.0</td>
<td>18.1</td>
<td>9.4</td>
<td>18.5</td>
<td>27.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>16.1</td>
<td>8.8</td>
<td>12.8</td>
<td>20.2</td>
<td>17.3</td>
<td>9.2</td>
<td>15.6</td>
<td>24.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>14.4</td>
<td>8.6</td>
<td>11.8</td>
<td>16.7</td>
<td>17.7</td>
<td>11.6</td>
<td>19.3</td>
<td>30.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>12.6</td>
<td>8.6</td>
<td>13.9</td>
<td>16.2</td>
<td>16.1</td>
<td>13.2</td>
<td>19.4</td>
<td>32.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>13.0</td>
<td>6.1</td>
<td>11.4</td>
<td>19.7</td>
<td>18.3</td>
<td>8.8</td>
<td>22.8</td>
<td>31.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>11.2</td>
<td>6.4</td>
<td>12.4</td>
<td>20.4</td>
<td>19.5</td>
<td>9.6</td>
<td>20.4</td>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>11.4</td>
<td>7.1</td>
<td>13.4</td>
<td>19.0</td>
<td>19.4</td>
<td>10.4</td>
<td>19.4</td>
<td>29.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>10.9</td>
<td>8.1</td>
<td>12.5</td>
<td>19.4</td>
<td>20.1</td>
<td>13.5</td>
<td>15.4</td>
<td>29.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>10.9</td>
<td>6.6</td>
<td>10.3</td>
<td>18.8</td>
<td>18.1</td>
<td>12.1</td>
<td>23.3</td>
<td>35.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>8.1</td>
<td>8.8</td>
<td>12.4</td>
<td>20.5</td>
<td>19.6</td>
<td>12.0</td>
<td>18.7</td>
<td>30.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>11.9</td>
<td>7.4</td>
<td>13.6</td>
<td>15.5</td>
<td>22.1</td>
<td>12.2</td>
<td>17.2</td>
<td>29.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>14.9</td>
<td>8.6</td>
<td>15.5</td>
<td>20.0</td>
<td>16.9</td>
<td>9.9</td>
<td>14.2</td>
<td>24.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>12.5</td>
<td>8.6</td>
<td>12.8</td>
<td>20.2</td>
<td>17.5</td>
<td>11.8</td>
<td>16.6</td>
<td>28.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>15.8</td>
<td>8.0</td>
<td>11.7</td>
<td>20.9</td>
<td>19.0</td>
<td>9.9</td>
<td>14.7</td>
<td>24.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>12.8</td>
<td>8.7</td>
<td>13.9</td>
<td>18.8</td>
<td>17.5</td>
<td>12.9</td>
<td>15.4</td>
<td>28.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>11.5</td>
<td>7.9</td>
<td>14.2</td>
<td>18.7</td>
<td>20.0</td>
<td>9.8</td>
<td>18.0</td>
<td>27.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>13.6</td>
<td>8.5</td>
<td>13.3</td>
<td>18.4</td>
<td>17.2</td>
<td>9.4</td>
<td>19.7</td>
<td>29.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>10.4</td>
<td>7.3</td>
<td>13.2</td>
<td>21.0</td>
<td>17.3</td>
<td>10.4</td>
<td>20.4</td>
<td>30.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>10.6</td>
<td>7.8</td>
<td>12.8</td>
<td>17.1</td>
<td>18.8</td>
<td>8.8</td>
<td>24.1</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>16.0</td>
<td>7.1</td>
<td>15.8</td>
<td>18.6</td>
<td>17.3</td>
<td>7.1</td>
<td>18.1</td>
<td>25.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Binary indicator comprised of 2 highest categories.
underestimated when calculated from sample surveys. Matters are improved when inequality is calculated from administrative records. We use data from Frank (2009) who calculates a number inequality measures following Cowell and Mehta (1982) based on data on the number of returns and adjusted gross income by the IRS.

Figure 2 shows average levels of inequality by state over the period of our analysis. The figure shows inequality to be the highest in New York, Massachusetts, Connecticut, Florida, Texas and California. The most equal states are Nevada, Idaho, Indiana, West Virginia, and Washington. Since the analysis to be developed below will emphasize temporal within-state variation, Figure 3 shows the evolution of inequality in different states (and regions) in the US from 1970 onwards. The figure illustrates a secular increase in inequality from 1970 to 2010, but it also shows the degree of these increases to be quite different in specific states. In the Northeast, for example, the levels of inequality across states are quite similar in 1970. By 2010, however, the Atkinson index has increases only from 0.17 to around 0.25 in some states. While it has experienced a much more explosive increase (from 0.17 to more than 0.35) in others.

Our choice of inequality measure follows directly from our theoretical model. Furthermore, the Atkinson index has a number of desirable properties (such as subgroup decomposability). However, some researchers might be more familiar or comfortable with the Gini index as a measure of inequality. Therefore, we also provide results with inequality measured via the Gini coefficient, calculated from the same source (Frank 2009) in our robustness section.
Figure 3: Evolution of inequality, $Q_{st}$, 1970-2010
Income distance  We measure income distance as the distance between a respondent’s household income and average national income in each year.\(^6\) The GSS captures income by asking respondents to place their total net household income into a number of income bands. We transform them into midpoints (see Hout 2004 for details). The top-coded income category value is imputed by assuming that the upper tail of the income distribution follows a Pareto distribution (e.g., Kopczuk et al. 2010). Finally, to allow meaningful comparison overtime, incomes are converted to constant dollars (with base year 2000). The distribution of income distances by state used in our analysis is summarized in appendix A.2.

Controls  To control for state-specific changes in economic conditions, we use yearly state-level unemployment rates. We calculate them by averaging the LA series from the Bureau of Labor Statistics for state monthly unemployment rates (Bureau of Labor Statistics 1992). As further individual-level characteristics we include a respondent’s age, gender, education (years of schooling), an African-American indicator variable, and a “non-white” summary indicator. Respondents’ labor market status is captured by indicator variables for currently being self-employed, unemployed, or in part-time employment. Finally we include an indicator for respondents living in urban areas, defined as cities with at least 50,000 inhabitants. Descriptive statistics of independent variables are given in Table A.1 in the appendix.

6. Results

Table 2 shows parameter estimates and standard errors for equation (13) under various model specifications.\(^7\) Columns (1) and (2) display results from our hierarchical model, without and with control variables respectively. In both we find that increasing income distance from the national mean is inversely related to support for redistribution. The direct effect of inequality on preferences is considerably reduced when we include a range of individual- and state-level control variables. In fact, there is no statistically reliable main effect of inequality in specification (2). However, our argument only implies a conditional effect of inequality, which is tested by our income-inequality interaction. Confirming our expectations, we find a positive effect, indicating that inequality matters more for the rich. The interaction is significant (in the statistical sense, we evaluate its substantive importance below).

\(^6\)This represents a simple centering, which leaves the distribution of incomes unchanged.
\(^7\)Appendix A.4 shows an extended version of this table where we additionally include bootstrapped standard errors. Our results are not affected by this choice.
Table 2: Income, inequality and redistribution preferences. Estimates and standard errors.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>-0.126</td>
<td>-0.105</td>
<td>-0.106</td>
<td>-0.189</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.020)</td>
</tr>
<tr>
<td>Inequality</td>
<td>1.402</td>
<td>0.696</td>
<td>0.994</td>
<td>2.195</td>
</tr>
<tr>
<td></td>
<td>(0.531)</td>
<td>(0.501)</td>
<td>(0.838)</td>
<td>(1.140)</td>
</tr>
<tr>
<td>Income × inequality</td>
<td>0.209</td>
<td>0.208</td>
<td>0.210</td>
<td>0.379</td>
</tr>
<tr>
<td></td>
<td>(0.058)</td>
<td>(0.058)</td>
<td>(0.059)</td>
<td>(0.075)</td>
</tr>
<tr>
<td>Controls</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Deviance</td>
<td>22172</td>
<td>21718</td>
<td>21640</td>
<td>—</td>
</tr>
<tr>
<td>BIC</td>
<td>22409</td>
<td>22063</td>
<td>22448</td>
<td>—</td>
</tr>
<tr>
<td>N</td>
<td>19025</td>
<td>19025</td>
<td>19025</td>
<td>19025</td>
</tr>
</tbody>
</table>

Specifications: (1), (2): Random effects, maximum likelihood estimates, (3) Fixed effects, maximum likelihood estimates, (4) Fixed effects, linear probability model.

As we discussed above, our empirical strategy relies on within-state changes over time. To make this more explicit, we estimate fixed effects version of our model in specification (3). Our results are remarkably similar. They again emphasize the fact that the effect of changing inequality is conditional on respondents’ income distance.

Finally, in specification (4) we employ a fixed effects linear probability model, which uses all seven categories of the dependent variable instead of our support indicator variable. This specification, too, produces clear evidence for the conditional effect of inequality on preferences.

A stricter statistical test for our theoretical argument is provided by computing the marginal effect of a change in inequality conditional on income. Let $ME(Q|Z,X)$ denote the marginal effect of inequality, $Q$, conditional on income, $Z$, and controls $X$. When calculating marginal effects, it is common to set control variables to their sample mean, producing marginal effects for a hypothetical “typical” individual, $ME(Q|Z = z, X = \bar{x})$. We opt for a cleared definition based on counterfactuals. What we are interested in are effects of changes in inequality (conditional on income) holding all else equal. Consequently, we calculate marginal effects for

---

8This is an unconditional fixed effects model, since there is no way to integrate state-specific constants out of the likelihood. It is well known that unconditional (or dummy variable) fixed effects estimators for probit models are biased (Greene 2004) due to the incidental parameters problem (Neyman and Scott 1948). However, since our number of cases per state is reasonably large, we expect this not to be of major concern. In any case, we estimate a conditional fixed effects model in specification (4).

Hanmer and Kalkan (2013) provide a detailed discussion of the advantages of this strategy.
each case changing only inequality and income and keeping all other variables at values observed for that case: $ME_i(Q|Z = z, X = x_i)$. Average marginal effects are then simple averages over the marginal effects for each case, $AME(Q|Z, X) = n^{-1} \sum_{i=1}^{n} M_i$.

Panel (A) of Table 3 shows average marginal (unconditional) effects of inequality and income distance on the propensity to support redistribution. These direct effects illustrate what we learned from Table 2. A marginal increase in income of all individuals leads to lower average support for redistribution, ceteris paribus. The main effects of inequality is not statistically distinguishable from zero.

Panel (B) of Table 3 shows average marginal effects of inequality conditional on income. More precisely, we calculate the effect of a marginal change in inequality among the rich (those at the 90th percentile of the income distribution) and the poor (those at the 10th). We argued that an upward shift in inequality will mainly affect the rich, making them more supportive of redistribution. We find that a marginal change in inequality has little effect on the redistribution preferences of the poor, but has a marked and statistically significant effect for the rich. As expected, we find that rising inequality increases support for redistribution among the rich. Before we present the substantive magnitude of this effect using predicted probabilities below, we calculate the difference in marginal effects between rich and poor, i.e. $AME(Q|Z = z, X_p) - AME(Q|Z = z, X)$.

We calculate a $\chi^2$ difference test, which shows that inequality does indeed affect the rich (statistically) significantly different.

To illustrate the substantive role of inequality in perhaps a more intuitive way, Figure 4 shows the average predicted probability of redistribution support. In this figure, the only factors that change in the comparison of predicted probabilities are income distance to the mean (in the x-axis) and the two levels of macro inequality (in the solid and dashed lines). High inequality refers to Atkinson index values at the 90th percentile of the state-level distribution (similar to that of Nevada and Florida in 2007), while low inequality refers to the 10th (as in Washington or Vermont in 1985). The results provide a clear picture of the correspondence between our theoretical argument (in Figure 1) and the empirical findings. While the poor are similarly likely to support redistribution in equal and unequal states, the rich

---

10 The fact that we find a significant effect in one group, and a non-significant effect in the other, does not itself show that the difference is significant (cf. Gelman and Stern 2006).
11 Average predicted probabilities are calculated similar to the average marginal effects described above. And they are, once again, based on specification (2) in Table 2.
Table 3: Marginal effects

(A) Marginal main effects

| Income     | $AME(Y|X)$         | $-0.017 \ (0.001)$ |
|------------|--------------------|---------------------|
| Inequality | $AME(Q|X)$         | $0.196 \ (0.163)$   |

(B) Marginal conditional inequality effect

| Poor       | $AME(Q|Y = y_p, X)$ | $-0.027 \ (0.199)$ |
|------------|---------------------|---------------------|
| Rich       | $AME(Q|Y = y_R, X)$  | $0.489 \ (0.157)$   |

Difference test $p=0.002$

Note: Average marginal effects, based on specification (2). Difference test is distributed $\chi^2$ with 1 df. $z_p$ refers to the 10th percentile of the equivalized, deflated income distribution, $z_R$ refers to the 90th percentile.

Figure 4: Average predicted probability of redistribution support as function of income distance in high and low inequality regions
are more likely to support redistribution in states characterized by high levels of inequality.

An alternative way to illustrate the effects found in Table 2 is offered in Figure 5. In this figure, levels of macro inequality are now in the x-axis and the two distances to the mean are now represented in the solid (the rich 90th percentile) and dashed (the poor, 10th percentile) lines. The predicted probabilities in this figure re-emphasize the main message in the paragraph above. For the poor, the level of macro inequality does not make much of a difference (although, within the confidence bounds, it is possible that their support for redistribution is slightly higher when macro inequality is high). Their likelihood to support redistribution fluctuates around a level close to 0.35. For the rich, on the other hand, the likelihood to support redistribution increases significantly as inequality grows (from below 0.20 when inequality is at its lowest, to almost 0.30 when it is at its highest).

7. Robustness checks

We conduct a number of robustness checks in order to investigate the sensitivity of our results to alternative theoretical explanations. Below we summarize results from 12 specifications. In each we estimate the full model, but only present parameter estimates for $\gamma_3 Q_{ist} z_{ist}$, the income-inequality interaction, to save space.
Specification (1) allows for a flexible nonparametric random effects distribution via Dirichlet Process priors (for recent political science applications see, e.g., Kyung et al. 2011; Stegmueller 2013b). The model is estimated in a Bayesian framework, which also provides an additional robustness check for our multilevel specification (cf. Stegmueller 2013a). We find almost unchanged results. Specification (2) uses the Gini inequality measure calculated from the Current population survey instead of IRS tax returns, which we think preferable. Our main results is confirmed. Or main model excludes social factors such as religion and social class. While clearly important, we argue that are orthogonal to the income-inequality nexus. Specifications (3) and (4) show that including a five category class measure as well as religiosity (church attendance) in the model leaves our results unchanged.

Insurance models of preferences pose that differences in skill specificity and occupational risk structures shape preferences in addition to income. We investigate if they replace our income-inequality nexus in specifications (5) and (6) and find our results unchanged. Similarly, we get identical results when we include industry effects.

As argued by Rodden (2010: 322), it is clear that individuals sort themselves into neighborhoods with similar demographic, occupational, income, and ultimately political preferences. We addressed this concern by including an individual-level survey variable, which indicates if the respondent lives in an urban region. As an additional check we include in specification (8) state population density (based on Census population estimates). Again, we find our results to be unchanged. Similarly, when we include a measure of racial heterogeneity (the state-level share of non-white population, calculated from the Current Population survey), we find our results to be robust. Another regional feature that could potentially harm our results are levels of crime, which might be the ‘real’ driver of redistribution preferences. We use data from the Federal Bureau of Investigation’s uniform crime reporting database on total regional crime rates in specification (10), and find our results confirmed. We also include state income per capita (calculated from the Current Population Survey) to control for the fact that states differ in incomes of their average citizen. Specification (11) shows that this does not impact our main finding.

Finally, our main model does not include ideology since we argue that redistribution preferences should be conceptualized as a (one) more specific manifestation of ideology. Nonetheless, in specification (12) in table 4 we show that our results hold even when including a 7-point ideology measure from the GSS.
Table 4: Robustness checks. Parameter estimates for income-inequality interaction

<table>
<thead>
<tr>
<th>Specification</th>
<th>$\gamma_3 Q_{st} z_{ist}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Nonparametric RE$^a$</td>
<td>0.171 (0.069)</td>
</tr>
<tr>
<td>(2) Gini</td>
<td>0.182 (0.056)</td>
</tr>
<tr>
<td>(3) Scaled top 1% income</td>
<td>0.222 (0.057)</td>
</tr>
<tr>
<td>(4) Social class</td>
<td>0.203 (0.059)</td>
</tr>
<tr>
<td>(5) Religion</td>
<td>0.209 (0.059)</td>
</tr>
<tr>
<td>(6) Skill specificity</td>
<td>0.209 (0.059)</td>
</tr>
<tr>
<td>(7) Occupational unempl.</td>
<td>0.174 (0.066)</td>
</tr>
<tr>
<td>(8) Industry effects</td>
<td>0.208 (0.059)</td>
</tr>
<tr>
<td>(9) Population density</td>
<td>0.207 (0.058)</td>
</tr>
<tr>
<td>(10) Nonwhite pop. share</td>
<td>0.208 (0.058)</td>
</tr>
<tr>
<td>(11) Regional crime rate</td>
<td>0.202 (0.058)</td>
</tr>
<tr>
<td>(12) Regional income</td>
<td>0.208 (0.058)</td>
</tr>
<tr>
<td>(13) Ideology</td>
<td>0.181 (0.061)</td>
</tr>
</tbody>
</table>

Note: Sample size same as in main model, except for 18,849 in specifications (4) and (6), 18,858 in (5) and (8), 16,501 in (7), and 17,969 in specification (13).

$^a$ Estimates are posterior mean and standard deviation.

8. Conclusion

It is perhaps most meaningful to conclude this paper by first reminding the reader about our main findings and, more importantly, referring to the alternatives we find no evidence for. Our results strongly support the existence of “income-dependent altruism.” The rich in more unequal places do support redistribution more than the rich in more equal places (while the poor’s support for redistribution is much less affected by macro inequality). This paper’s analyses provide limited support for alternative approaches to other-regarding preferences. Neither the “reference-dependent inequity aversion” preferences proposed by Fehr and Schmidt (1999) nor the “fairness” preferences in Alesina and Angeletos (2005) seem to apply to the demand for redistribution in the US.

In the previous pages, we de-emphasized arguments about empathy and beliefs in a just world, but our analyses also introduce a degree of doubt about their relevance. In a significant contribution to the literature on redistribution, Lupu and Pontusson (2011) propose that macro-levels of equality are related to empathy. They argue that, because of social affinity, individuals will be inclined to have more similar redistribution preferences to those who are closer to them in terms of income distance. While Lupu and Pontusson emphasize skew (rather than Atkinson or Gini
indeces) and the position of the middle class, their argument implies that social affinity would make the rich have higher levels of support for redistribution as inequality decreases and they become closer to the middle class and the poor (the opposite of the predictions in this paper). A similar relationship would be expected by the approach that relates beliefs in a just world to redistribution preferences. To the extent that macro-levels of inequality are related to these beliefs (for example that inequality rewards the hard-working and punishes the lazy), we would observe lower levels of support for redistribution from the rich in states with higher inequality and a higher normative tolerance for it (Benabou and Tirole 2006; Alesina and Glaeser 2004). Our evidence fails to support these arguments.

Our research, finally, runs counter to a set of findings in the psychology literature about the influence of income on charity giving and pro-social behavior. Using surveys conducted in the US, some authors find that lower income individuals give proportionally more to charitable causes than higher income ones (see for example, James and Sharpe 2007). Other authors using experimental data find that subjective perceptions of one’s social class rank in society promote generosity and charitable donations (see Piff et al. 2010). This paper does not address the side of altruism that concerns voluntary donations. But our results do indicate that, irrespective of charity, the rich are more likely to support government-based redistribution.

We will conclude by noting that, in some ways, this paper presents profoundly unintuitive result (the rich are more supportive of redistribution in those states where inequality is highest). One might ask why we do find more inequality in precisely the places where the rich are more supportive of redistribution. We think this is an important question in need of a significant amount of further research. As McCarty and Pontusson (2009) note, models of the political economy of redistribution involve two separate propositions: there is a “demand” side, concerning the redistribution preferences of voters, and a “supply” side, concerning the aggregation of these preferences and the provision of policy. In this paper we have focused on the first proposition and ignored the second. It is germane, however, to ask whether these redistribution preferences have any political consequences. In a related paper, Rueda and Stegmueller (2014) answer this question in the affirmative. They show that in the US, redistribution preferences are a significant determinant of voting. More concretely, they demonstrate that income distance matters to voting mainly through its effect on redistribution preferences. Preferences alone explain half of the total effect of income on vote choice. While more research on the supply side of

\[\text{This research has found wide resonance in the popular press. See Greve (2009) or Johnston (2005).}\]
redistribution is clearly needed (a number of factors may intermediate between vot-
ing and the provision of redistributive policy), the political relevance of this paper's
findings should not be ignored.
References


American Political Science Review 95(4), 859–874.


A. Appendix

A.1. Proofs

Proof of Lemma 1

We show that \( \Omega = u[\bar{c}(1 - Q)] = u(c_e) \), where

\[
\bar{c}(1 - Q)
\]

is the "abbreviated social welfare function." This equivalence, well-known in the welfare economics literature, is reproduced here for the convenience of the reader. For further discussion, see Atkinson (1970) and Lambert (1989: 109-136).

To begin, let \( c_e = (1 - \tau)y_e + T \) be the level of disposable income that represents the average utility given by the social welfare function, or

\[
\frac{1}{n} \sum_{j=1}^{n} u(c_j) = \frac{1}{n} nu(c_e) = u(c_e).
\]

By Jensen’s Inequality, we know that \( c_e \in (0, \bar{c}) \) and therefore that \( y_e \in (0, \bar{y}) \). In fact, Atkinson (1970) characterizes this level of income as "equally distributed equivalent income," and it is the basic building block of the Atkinson Index. It represents the level of income that if held by every individual would give that society the same level of welfare as would obtain with any given allocation of unequally distributed incomes. The Atkinson index is constructed as:

\[
Q = 1 - \frac{c_e}{\bar{c}}.
\]

Since \( c_e \) is strictly below mean income, this expression is always positive and always between 0 and 1. Indeed, as inequality increases, social welfare decreases as does \( c_e \). This will be a useful property for subsequent proofs.

Next, using the specific functional form for CRRA preferences in equation (6), we can rewrite equation (A.2) as:

\[
\frac{c_e^{1-\epsilon}}{1-\epsilon} = \frac{1}{n} \sum_{j=1}^{n} \frac{c_j^{1-\epsilon}}{1-\epsilon}
\]
Rearranging this equation in terms of $c_e$, we obtain:

$$c_e = \left( \frac{1}{n} \sum_{j=1}^{n} c_j^{1-\epsilon} \right)^{1/(1-\epsilon)} \quad (A.5)$$

Then, substituting this expression into the preliminary Atkinson Index in equation (A.3), we obtain:

$$Q = 1 - \frac{1}{c} \left( \frac{1}{n} \sum_{i=1}^{n} c_i^{1-\epsilon} \right)^{1/(1-\epsilon)} \quad (A.6)$$

which is equivalent to the expression given in equation (8) for $\epsilon \neq 1$.

Finally, to recover the social welfare function, substitute the Atkinson Index in (A.6) into the abbreviated social welfare function (A.1) and then substitute the result into the CRRA preferences in equation (6). The result is $\Omega$. Hence, we have $\Omega = u[c(1-Q)] = u(c_e)$.

$\square$

Proof of Proposition 1

First, we prove Part (A). The individual’s problem is to choose the tax rate that maximizes her social utility function, given by equation (4):

$$\max_{\tau \in [0,1]} V = u(c_i) + \delta u(c_e) \quad (A.7)$$

subject to the government budget constraint in equation (2) and the individual’s own budget constraint in equation (3). The first-order condition for this problem gives the preferred level of redistribution for each individual $i$, which we will term $\tau^*_i$:

$$u'(c_i)\left[(1 - \tau^*_i)\bar{y} - y_i\right] + \delta u'(c_e)\left[(1 - \tau^*_i)\bar{y} - y_e\right] = 0 \quad (A.8)$$

The second-order condition is given by:

$$\frac{\partial^2 V}{\partial \tau^2} \equiv \sigma(\tau^*_i, y_i, y_e) = u''(c_i)\left[(1 - \tau)\bar{y} - y_i\right]^2 - u'(c_i)\bar{y}$$

$$+ \delta u''(c_e)\left[(1 - \tau)\bar{y} - y_e\right]^2 - \delta u'(c_e)\bar{y} < 0 \quad (A.9)$$

which is unambiguously negative.

Next, we show that $\tau^*_i \in [0, 1)$. Rearrange the first-order condition as:

$$\tau^*_i = \left(1 - \frac{y_i}{\bar{y}}\right) + \delta \left(\frac{c_i}{c_e}\right)^{\epsilon} \left[(1 - \tau^*_i) - \frac{y_e}{\bar{y}}\right] \quad (A.10)$$
If $\delta = 0$, that is, if individuals are not altruistic, then individual $i$’s optimal choice of redistribution is $\tau^*_i = 1 - y_i/\bar{y}$, which is a familiar result for self-interested preferences. In this case, preferences for redistribution are clearly decreasing in income, with $\tau^*_i$ going from 1 to 0 as income goes from 0 to $\bar{y}$. Compare this to altruistic individuals, $\delta > 0$. Setting $\tau = 0$, equation (A.10) can be rewritten as:

$$
\delta \left( \frac{y_i}{y_e} \right) = -\frac{(\bar{y} - y_i)}{y_e - \bar{y}} \tag{A.11}
$$

Since the left-hand side is positive, this condition requires $y_i > \bar{y}$. Define the value of $y_i$ that satisfies this equation as $\hat{y}$. Hence, $\hat{y} > \bar{y}$, as claimed. Notice also that $\hat{y}$ is potentially quite large, especially as in equality increases: $y_e \to 0$. Finally, the maximum level of redistribution preferred by any individual is always less than one. Setting $\tau = 1$ in equation (A.10), we get

$$
\delta = -\left( \frac{y_i}{y_e} \right) \tag{A.12}
$$

which is never satisfied.

Further exploration of equation (A.10) provides some additional important insights. First, let $\tau^*_e$ be the level of redistribution that maximizes social welfare, $\Omega = u(c_e)$. The value of $\tau^*_e$ is such that the first-order condition for maximizing social welfare equals zero, which is $(1 - \tau^*_e) = y_e/\bar{y}$. Evaluated at $\tau^*_e$, the second expression on the right-hand side of equation (A.10) becomes zero, so equation (A.10) becomes $\tau^*_e = 1 - y_i/\bar{y}$. Clearly, the level of individual income that satisfies this expression is $y_e$. Hence, an individual with income $y_i = y_e$ prefers the level of redistribution that maximizes social welfare. Furthermore, along with Part (B) below, this also implies that for $y_i > y_e$, we have $\tau^*_i < \tau^*_e$ and thus $(1 - \tau^*_i) - y_e/\hat{y} > 0$. That is, for $y_i > y_e$, an individual prefers a level of taxes and transfers such that the marginal benefit of reducing inequality exceeds its cost. In other words, individuals with income above the equally distributed equivalent prefer less redistribution than social welfare demands, and hence social welfare is positive and increasing at this level of redistribution. However, this also means that for $y_i > y_e$, an individual prefers more redistribution than if she were purely self-interested. To see this, evaluate equation (A.10) for a self-interested individual (i.e., $\delta = 0$) with income $y_i > y_e$. This implies that $(1 - \tau) - y_i/\hat{y} = 0$. Compared to an altruistic individual ($\delta > 0$), this makes the second term on the right-hand side of (A.10) positive, because social welfare is increasing for $\tau^*_i < \tau^*_e$, which implies that $\tau^*_i(y_i > y_e, \delta > 0) > \tau^*_i(y_i > y_e, \delta = 0)$. Because this is true, this also implies that
for an altruistic individual we have \((1 - \tau) - y_i/\bar{y} < 0\). That is, the marginal benefit of redistribution to an individual’s material self interest is lower than its cost. In other words, relatively well-off individuals sacrifice some material self interest in order to satisfy their altruistic preferences for reducing inequality. An analogous argument holds for \(y_i < y_e\). However, these cases require choosing more redistribution than social welfare requires, \((1 - \tau) - y_e/\bar{y} < 0\). Further, this means that the second term on the right-hand side of equation (A.10) is now negative, which implies that an individual with \(y_i < y_e\) prefers less redistribution than self-interest demands: \((1 - \tau) - y_i/\bar{y} > 0\). To summarize, individuals with income below the equally distributed equivalent \((y_i < y_e)\) want less redistribution than they would if they were purely self interested, but more redistribution than is socially optimal. In contrast, individuals with income above the equally distributed equivalent \((y_i > y_e)\), prefer more redistribution than if they were purely self interested but less than is socially optimal.

Second, we prove Part (B), that an individual \(i\)'s preferred level of redistribution \(\tau_i^\ast\) is decreasing in individual income \(y_i\). Formally, we seek to demonstrate that \(\frac{\partial \tau_i^\ast}{\partial y_i} < 0\). Totally differentiating the first-order condition in equation (A.8), we obtain

\[
\frac{d \tau_i^\ast}{d y_i} = -\frac{u''(c_i)[(1 - \tau)\bar{y} - y_i](1 - \tau) - u'(c_i)}{\sigma(\tau_i^\ast, y_i, y_e)} \tag{A.13}
\]

Since the expression in the denominator is negative, the sign of the derivative depends on the sign of the numerator. For \((1 - \tau)\bar{y} \geq y_i\), the numerator is clearly negative. For \((1 - \tau)\bar{y} < y_i\), the numerator is negative if the following condition holds: \(u''(c_i)[(1 - \tau)\bar{y} - y_i](1 - \tau) - u'(c_i) < 0\). This condition reduces to \((1 - \epsilon)y_i + (1 - \tau)\bar{y} + T'(1 - \tau) > 0\), which is true for all \(\epsilon \in (0, 1)\), all \(y_i \in [0, \infty)\), and all \(\tau \in [0, 1]\). Hence, we have \(\frac{\partial \tau_i^\ast}{\partial y_i} < 0\). This proves Part (B).

Third, we prove Part (C). Part (C) states that an individual \(i\)'s preferred level of redistribution \(\tau_i^\ast\) is increasing in inequality \(Q\). Formally, we demonstrate that \(\frac{\partial \tau_i^\ast}{\partial Q} > 0\). From Lemma 1, we can express a change in inequality as an increase in \(Q\): \(y_e = Q_0 - Q\). Totally differentiating the first-order condition in equation (A.8), we obtain

\[
\frac{d \tau_i^\ast}{d Q} = -\frac{\delta [-u''(c_e)[(1 - \tau)\bar{y} - y_e](1 - \tau) + u'(c_e)]}{\sigma(\tau_i^\ast, y_i, y_e)} \tag{A.14}
\]

Once again, since the expression in the denominator is negative, the sign of the derivative depends on the sign of the numerator. The numerator is clearly positive for \((1 - \tau)\bar{y} \geq y_e\). For \((1 - \tau)\bar{y} \leq y_e\), the expression in the numerator is positive if the following condition holds: \(-u''(c_e)[(1 - \tau)\bar{y} - y_e](1 - \tau) + u'(c_e) > 0\). This
condition reduces to \((1 - \epsilon) y_e + \epsilon (1 - \tau) \bar{y} + T/(1 - \tau) > 0\), which is true for all \(\epsilon \in (0, 1)\), all \(y_e \in [0, \bar{y}]\), and all \(\tau \in [0, 1]\). Hence, we have \(\frac{\partial \tau_i^*}{\partial Q} > 0\).

Fourth, we prove Part (D). Part (D) states that the effect of an increase in inequality \(Q\) on an individual \(i\)‘s preferred level of redistribution \(\tau_i^*\) is increasing in individual income \(y_i\). Formally, this requires \(\frac{\partial^2 \tau_i^*}{\partial Q \partial y_i} > 0\). The cross-partial derivative yields a complicated expression that is difficult to sign unambiguously. We therefore proceed through a more inductive route. It will suffice to show that

\[
\Delta \tau_j - \Delta \tau_i \equiv (\tau_i^*(y_e') - \tau_i^*(y_e)) - (\tau_i^*(y_j') - \tau_i^*(y_j)) > 0 \tag{A.15}
\]

for any \(y_j > y_i, y \in [0, \infty)\) and any \(y_e > y_e', y_e \in (0, \bar{y})\). Using the version of the first-order condition in equation (A.10), consider the difference in support for redistribution from an individual with income \(y_i\) when inequality increases, \(y_e > y_e'\):

\[
\Delta \tau_i \equiv \tau_i^*(y_e') - \tau_i^*(y_e) = \delta \left( \frac{c_i}{c_e} \right) \epsilon \left[ (1 - \tau_i^*(y_e')) - \frac{y_e'}{\bar{y}} \right] - \delta \left( \frac{c_i}{c_e} \right) \epsilon \left[ (1 - \tau_i^*(y_e)) - \frac{y_e}{\bar{y}} \right] \tag{A.16}
\]

From Part (C) we know that \(\tau_i^*(y_e') > \tau_i^*(y_e)\) and therefore that

\[
\left( \frac{c_i}{c_e} \right) \epsilon \left[ (1 - \tau_i^*(y_e')) - \frac{y_e'}{\bar{y}} \right] > \left( \frac{c_i}{c_e} \right) \epsilon \left[ (1 - \tau_i^*(y_e)) - \frac{y_e}{\bar{y}} \right] \tag{A.17}
\]

Note that this holds regardless of whether or not \(y_i \gtrless y_e\). Next consider an increase in individual income, \(y_j > y_i\), for a given level of inequality, \(y_e\). The difference of the first-order condition between these two individuals gives:

\[
\tau_i^*(y_e) - \tau_j^*(y_e) = \left( \frac{y_j - y_i}{\bar{y}} \right) + \delta \left( \frac{c_i}{c_e} \right) \epsilon \left[ (1 - \tau_i^*(y_e)) - \frac{y_e}{\bar{y}} \right] - \delta \left( \frac{c_i}{c_e} \right) \epsilon \left[ (1 - \tau_j^*(y_e)) - \frac{y_e}{\bar{y}} \right] \tag{A.18}
\]

From Part (B) we know that \(\tau_i^*(y_e') > \tau_j^*(y_e)\). However, it is also true that:

\[
\left( \frac{c_j}{c_e} \right) \epsilon \left[ (1 - \tau_j^*(y_e)) - \frac{y_e}{\bar{y}} \right] > \left( \frac{c_i}{c_e} \right) \epsilon \left[ (1 - \tau_i^*(y_e)) - \frac{y_e}{\bar{y}} \right] \tag{A.19}
\]

(which makes the sum of these two expressions in equation (A.18) negative in the case \(y_j > y_i > y_e\) and positive in the case \(y_e > y_j > y_i\), etc.) First, \(\tau_i^*(y_e') > \tau_j^*(y_e)\)
implies \( 1 - \tau_j(y_e) > 1 - \tau_i(y_e) \), which in turn implies \( [(1 - \tau_j(y_e)) - y_e/\bar{y}] > [(1 - \tau_i(y_e)) - y_e/\bar{y}] \). Second, both \( \tau_i(y_e) > \tau_j(y_e) \) and \( y_j > y_i \) imply that \( (c_j/c_e) > (c_i/c_e) \). □
A.2. Distribution of income distance by state

![Graph showing the distribution of income distance by state, 1978-2010. Kernel density estimates (Gaussian kernel, bandwidth 1.1).](image)

**Figure A.1:** Distribution of income distance by state, 1978-2010. Kernel density estimates (Gaussian kernel, bandwidth 1.1).
### A.3. Descriptive statistics

<table>
<thead>
<tr>
<th>Continuous variables</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income distance [10,000$]</td>
<td>0.076</td>
<td>3.595</td>
<td>-5.687</td>
<td>12.542</td>
</tr>
<tr>
<td>Inequality (Gini)</td>
<td>0.557</td>
<td>0.053</td>
<td>0.439</td>
<td>0.697</td>
</tr>
<tr>
<td>Inequality (Atkinson)</td>
<td>0.249</td>
<td>0.047</td>
<td>0.164</td>
<td>0.405</td>
</tr>
<tr>
<td>Age [10 yrs]</td>
<td>3.983</td>
<td>1.169</td>
<td>2.000</td>
<td>6.500</td>
</tr>
<tr>
<td>Education [yrs]</td>
<td>13.338</td>
<td>2.866</td>
<td>0.000</td>
<td>20.000</td>
</tr>
<tr>
<td>State unemployment</td>
<td>6.182</td>
<td>2.029</td>
<td>2.300</td>
<td>17.400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator variables</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>54.0</td>
</tr>
<tr>
<td>Black</td>
<td>13.5</td>
</tr>
<tr>
<td>Other race</td>
<td>5.4</td>
</tr>
<tr>
<td>Part-time employed</td>
<td>11.9</td>
</tr>
<tr>
<td>Unemployed</td>
<td>6.4</td>
</tr>
<tr>
<td>Self-employed</td>
<td>11.4</td>
</tr>
</tbody>
</table>
### A.4. Bootstrap standard errors

**Table A.2:** Income, inequality and redistribution preferences. Estimates with analytical standard errors in parentheses and cluster-bootstrap standard errors in brackets.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>−0.126</td>
<td>−0.105</td>
<td>−0.106</td>
<td>−0.189</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.020)</td>
</tr>
<tr>
<td></td>
<td>[0.017]</td>
<td>[0.017]</td>
<td>[0.016]</td>
<td>[0.022]</td>
</tr>
<tr>
<td>Inequality</td>
<td>1.402</td>
<td>0.696</td>
<td>0.994</td>
<td>2.195</td>
</tr>
<tr>
<td></td>
<td>(0.531)</td>
<td>(0.501)</td>
<td>(0.838)</td>
<td>(1.140)</td>
</tr>
<tr>
<td></td>
<td>[0.628]</td>
<td>[0.589]</td>
<td>[0.842]</td>
<td>[1.091]</td>
</tr>
<tr>
<td>Income × inequality</td>
<td>0.209</td>
<td>0.208</td>
<td>0.210</td>
<td>0.379</td>
</tr>
<tr>
<td></td>
<td>(0.058)</td>
<td>(0.058)</td>
<td>(0.059)</td>
<td>(0.075)</td>
</tr>
<tr>
<td></td>
<td>[0.065]</td>
<td>[0.063]</td>
<td>[0.060]</td>
<td>[0.084]</td>
</tr>
<tr>
<td>Controls</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Deviance</td>
<td>22172</td>
<td>21718</td>
<td>21640</td>
<td>—</td>
</tr>
<tr>
<td>BIC</td>
<td>22409</td>
<td>22063</td>
<td>22448</td>
<td>—</td>
</tr>
<tr>
<td>N</td>
<td>19025</td>
<td>19025</td>
<td>19025</td>
<td>19025</td>
</tr>
</tbody>
</table>

Specifications: (1), (2): Random effects, maximum likelihood estimates, (3) Fixed effects, maximum likelihood estimates, (4) Fixed effects, linear probability model. Bootstrap standard errors based on 200 re-samples within state panels.