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Knowledge is power: A theory of information, income, and welfare spending

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Knowledge is power
A theory of information, income, and welfare spending*

Jo Thori Lind† Dominic Rohner‡

October 10, 2011

Abstract

No voters cast their votes based on perfect information, but better educated and richer voters are on average better informed than others. We develop a model where the voting mistakes resulting from low political knowledge reduce the weight of poor voters, and cause parties to choose political platforms that are better aligned with the preferences of rich voters. In US election survey data, we find that income is more important in affecting voting behavior for more informed voters than for less informed voters, as predicted by the model. Further, in a panel of US states we find that when there is a strong correlation between income and political information, Congress representatives vote more conservatively, which is also in line with our theory.

JEL Classification: D31, D72, D82, H53.

Keywords: Redistribution, Welfare Spending, Information, Income, Voting, Political Economics.

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1 Introduction

Politics is complex. As voters are time constrained, and aware of the fact that they are unlikely to be pivotal in large-scale elections, they lack incentives to study all details and aspects of the political choices ahead. While most voters are therefore imperfectly informed about politics, the level of political information varies among people.

What are the consequences if some voters are better informed about politics, and thus better at picking the most suitable political party for themselves? And what happens if this political knowledge is systematically skewed – i.e. if the better educated – who tend to be wealthier – are better at choosing their most favorable party? These are the questions we study in this paper.

In our model, we abandon the usual assumption of perfect information and assume instead that only a fraction of the voters observe the electoral platforms. The probability that a given voter observes them is increasing in what we label her *political knowledge*. Income and political knowledge are often positively correlated, for instance because the better educated are both better informed and better paid. This implies that richer voters are on average better at seeing through political rhetoric and at choosing the best party to implement their interests.

Further, in our framework voters want more redistribution the lower their income. Parties have political ideal points, but propose platforms that also appeal to as many voters as possible. Generally, the lower the level of political information, the more the parties concentrate on their own ideal points as fewer voters grasp their platforms. If information is unevenly distributed – with rich voters being better informed, however, this tends to pull both left-wing and right-wing parties towards the preferences of the rich, which in our setting implies less redistribution.

We test the model's assumptions and predictions using data from the American National Election Studies (ANES). First, we confirm that more educated and richer voters are indeed better informed politically, measured both by self reported interest in politics and by whether they follow politics and the electoral campaigns in the media.

To explore the predictions on voter behavior, we study how the relationship between income and voting depends on the level of information. As our model predicts, income is a better predictor of voting for the better informed voters whereas the voting behavior of the less well informed voters contains more randomness. To study the effect of the distribution of information on party behavior, we compare representatives in the House and the Senate from states and periods where the correlation between income and our measures of information is high to representatives in other states and periods where this income-information correlation is low. When there is a strong correlation, the voting patterns of both Republican and Democrat representatives shift to the right. To the best of our knowledge these are novel

empirical findings.

Our paper relates to several literatures. The benchmark for our theoretical framework is based on existing models of electoral competition[1], and our results may shed new light on the so-called "redistribution puzzle",[2] i.e. the robust empirical finding that redistribution levels are not as high as predicted by these models and that levels of redistribution are lower rather than higher in more inegalitarian societies.[3]

There is also a quite extensive theoretical literature on the effect of information on voters' decisions. It has been argued that the level of voter information does not matter for electoral outcomes and that uninformed voters can achieve a "full information equivalent" outcome through cues, information shortcuts and biases cancelling out in aggregation (McKelvey and Ordeshook, 1985; Wittman, 1989; Lupia, 1992). Also the pivotal voting literature usually predicts that uninformed voters balance the partisan bias or abstain, assuring in this way that the same outcome as under full information occurs (cf., for example, Austin-Smith and Banks, 1996; Feddersen and Pesendorfer, 1996, 1997). In contrast, our theory aims to show that information does matter for political outcomes.[4]

These theoretical contributions also contrast with most of the empirical evidence, which usually finds that uninformed voters do not vote "correctly" (i.e. according to their best interest), and that lack of information biases voting outcomes (Palfrey and Poole, 1987; Delli Carpini and Keeter, 1996; Bartels, 1996; Gilens, 2001). There is also an important emerging literature on the effects of media on politics. Its focus has been on e.g. political turnout (Oberholzer-Gee and Waldfogel, 2009), voting outcomes (Della Vigna and Kaplan, 2007; Gerber et al., 2009), political outcomes (Strömberg 2004a,b), and the relationship between media markets and political outcomes (Chan and Suen, 2008).

There are a few models of voting under incomplete information in the literature, but none of them links information to income. Banks (1990) studies conditions under which an equilibrium exists when voters do not know politicians' exact positions. Martinelli (2006) and Feddersen and Sandroni (2006) model the conditions under which rational voters would have incentives to acquire costly information. Rohner (2009) builds a model with noisy signals,

[1]Cf. the median voter models of Downsian electoral competition (e.g., Downs, 1957; Romer, 1975; Roberts, 1977; Meltzer and Richard, 1981) and probabilistic voting models (see Lindbeck and Weibull, 1987).

[2]See for example Perotti (1996) or Moene and Wallerstein (2001, 2003). Lind (2005) provides a survey of this literature.

[3]There are also other theoretical arguments and explanations in the literature for why redistribution levels are relatively low and the poor do not expropriate the rich, including the lower level of political participation of the poor (Harms and Zink, 2003; Larcinese, 2005), multi-dimensional issue spaces (Roemer, 1998), collective action problems of the poor and interest groups (Olson, 1965), the deadweight loss from taxation (Meltzer and Richard, 1981), the need for a social hierarchy (Corneo and Grüner, 2000), the dynamics of perceived social mobility (Piketty, 1995) and the prospects of upward mobility (Hirschman and Rothschild, 1973).

[4]A related strand of literature studies how some uninformed voters give special interest groups political influence through campaign contributions and endorsements (Baron 1994, Grossman and Helpman 1996).

where in societies with a high proportion of uninformed voters candidates with a low level of "valence" (i.e. of honesty and competence) have an increased probability of getting elected into office. Gul and Pesendorfer (2009) emphasize a framework with ignorant voters, where candidates with a "preferred personality" can gain re-election despite implementing partisan policies that lead to lower expected payoffs for the electorate.[5]

The remainder of our contribution is organized as follows. Section 2 presents a simple model, while Sections 3 and 4 test the model's predictions with respect to voting behavior and political outcomes, respectively. Section 5 concludes and the Appendix contains an extension of the model, data information and supplementary estimations.

2 The Model

2.1 Voters

We consider a unit mass of voters differentiated by income y, where y follows a distribution with cdf F and density f. There is a government that levies a uniform tax τ which is spent on redistribution and/or public goods provision. A voter with income y has preferences over taxes described by the indirect utility function $U(\tau, y)$ – typically poorer voters prefer higher taxes. To assure the existence of a political equilibrium, we impose Assumption 1.

Assumption 1 *The preferred tax rate is decreasing in income, and U satisfies Gans and Smart's (1996) single crossing property.*

Individuals have different levels of political information and knowledge. If information acquisition has even a small cost, it is implausible that agents acquire it for the sole purpose of making appropriate party choices, as the probability of being pivotal is minuscule. Still, one would expect that more educated individuals are better informed. One rationale for this is that information has a consumption value, but acquisition of information is costly. If the cost is declining in the level of human capital, this generates a positive correlation between political knowledge and human capital. As education and income are positively correlated, this also implies a positive correlation between income and political information. To summarize:

Assumption 2 *Education is both positively related to income and negatively related to the cost of acquiring political information. Hence, ceteris paribus, rich voters are better informed.*

In Appendix A.1 we present a simple model that provides micro foundations for these two assumptions.

[5] In Hodler, Loertscher and Rohner (2010) incumbents can manipulate beliefs by implementing inefficient policies.

The voters face two parties L and R that both propose a political platform described by tax policies τ_L and τ_R. The parties announce their platforms. However, the likelihood of receiving this announcement depends on the voter's political information. To simplify, we assume that a voter either receives a perfect signal or no signal at all (i.e. a completely non-informative signal). Formally, a voter gets the informative signal with probability $\pi(y)$ where π is increasing in y. Voters who do not receive the signal are assumed to be completely uninformed about the platforms. All our results would be qualitatively unchanged if we were to allow for uninformed voters having some partial information about platforms, e.g. obtaining information about the distribution of possible platforms, receiving some noisy signal of the platforms etc. For expositional ease we maintain here the "sharp" assumption of uninformed voters having no information about platforms.

To further simplify the model, we assume that uninformed voters have Knightian uncertainty over the parties' political positions to avoid the issue of prior beliefs of positions. Hence uninformed voters cannot condition their party choice on announced policies, and judge $U(\tau_L, y)$ equal to $U(\tau_R, y)$. [6]

2.2 Political parties

The two parties L and R care both about winning the elections and about the implemented policies, following Wittman's (1983) approach. The reason for choosing such a setting is twofold: First, there is clear and strong empirical evidence suggesting that in reality parties care about policies as well as about winning elections and that party platforms do never fully converge (cf. the discussions in Roemer, 1998, 1999). Second, Downsian or probabilistic voting models with converging political platforms either preclude non-informed voters or imply irrational voters as the non-informed voters could simply solve the model.[7]

We assume that parties value policies according to the same utility function U as voters.

[6] One objection to the assumption of Knightian uncertainty is that uninformed voters could learn the party types y_L and y_R from observing the political outcomes of past elections. In a companion paper, Lind and Rohner (2011), we consider an extended version of the current model where there are different candidates running for each party at each election. This introduces uncertainty about the preferences of the currently running candidate and hence resolves this problem. The conclusions are virtually unchanged, but the model becomes more involved.

[7] This is for instance a drawback of Strömberg's (2004a,b) model. He builds a probabilistic voting model where voters care about the policies implemented and have some randomly distributed preferences over personal characteristics of the candidates. As all aspects of the model (besides the platforms) are common knowledge, the uninformed voters face the same information set as the parties and should accordingly be able to work out what platforms the parties will choose. Strömberg (2004b: 269) is aware of this problem and solves it by assuming that "each voter i is uncertain about how useful the publicly provided services are to the other voters (...). They know the continuous distribution from which these parameters are drawn, but not the realized values. This makes the voters unable to solve for the unique political equilibrium spending levels (...)". However, for this argument to have any major impact on policy outcomes, the electorate has to be very small. Given the law of large numbers, even in modest electorates the theoretical distribution of voters is a close approximation of the realized outcome.

Specifically, the parties have political positions corresponding to the income levels y_L and y_R, respectively.[8] They simultaneously propose platforms $\tau_L, \tau_R \in [0,1]$ with commitment. We assume that y_L and y_R are such that party L chooses a policy to the left of the utilitarian maximum and R a policy to the right, i.e.

$$\tau_R < \arg\max_{\tau} \int_0^{+\infty} U(\tau, y)\ dF(y) < \tau_L. \tag{1}$$

Voters then vote sincerely for their preferred party, and the party with the largest number of votes takes office and implements its proposed policy.

Platform τ_L is chosen to maximize

$$P(\tau_L, \tau_R)\left[U(\tau_L, y_L) + Z\right] + \left[1 - P(\tau_L, \tau_R)\right] U(\tau_R, y_L), \tag{2}$$

where $P(\tau_L, \tau_R)$ is the probability of party L winning the election for the given set of platforms and $Z \geq 0$ are rents from being in office. An analogue expression holds for party R. Assuming that P is differentiable (which will be shown below), the chosen platform satisfies the first order condition:

$$\frac{\partial P(\tau_L, \tau_R)}{\partial \tau_L}\left[U(\tau_L, y_L) - U(\tau_R, y_L) + Z\right] = -P(\tau_L, \tau_R)\frac{\partial U(\tau_L, y_L)}{\partial \tau_L}. \tag{3}$$

This implies that the chosen platform is a trade-off between the politician's preferred policy and the policy that maximizes the probability of winning the election.

2.3 Voting behavior

Voters are assumed to care about policies τ and the popularity or valence of the politician, which is in line with the probabilistic voting literature (Lindbeck and Weibull, 1987). After announcing their policies, politicians receive an aggregate popularity shock δ and idiosyncratic taste shocks σ_i. This assumption guarantees continuity and differentiability of the election probability P. In particular, the aggregate popularity shock δ captures R's relative popularity and is assumed to have mean zero and a symmetric distribution with cdf H. Moreover, we make the technical assumption that H is log concave, i.e. that $\frac{h(\delta)}{H(\delta)}$, with $h(\delta) = H'(\delta)$, is decreasing in δ. Most commonly used distributions, such as the normal or the uniform, have log concave cdf – see Bagnoli and Bergstrom (2005) for a more complete list and discussion of log concave distributions. The individual shocks σ_i, capturing the relative taste for R, have a symmetric distribution centered around zero and cdf S.

A voter with income y_i is informed with probability $\pi(y_i)$. When informed, voters vote

[8] The income y_i could be seen as the candidates' true income in a citizen-candidate framework (Besley and Coate, 1997; Osborne and Slivinsky, 1998) or more generally as an identity the party takes upon itself.

for the platform which best satisfies their preferences. An informed voter with income y_i then votes L if $U(\tau_L, y_i) > U(\tau_R, y_i) + \delta + \sigma_i$. Thus, a share $S[U(\tau_L, y) - U(\tau_R, y) - \delta]$ of voters with income y vote L.

From the single crossing property it follows that for given proposed platforms, δ, and σ_i, there is a threshold income where everybody with income below votes L and everybody above votes R. Hence, $S[U(\tau_L, y) - U(\tau_R, y) - \delta]$ is decreasing in y. Finally, the number of votes party L receives from informed voters is given by

$$V^I(\tau_L, \tau_R, \delta) = \int_0^{+\infty} S[U(\tau_L, y) - U(\tau_R, y) - \delta]\pi(y)\, dF(y). \tag{4}$$

With probability $1-\pi(y)$, a voter is uninformed and receives no signal about the parties' platforms. As beliefs about positions have been assumed away, it follows that their vote is not affected by their private economic situation, only by the random popularity of the parties δ and an individual taste shock σ_i. Hence, the number of votes party L receives from non-informed voters is

$$V^{NI}(\delta) = S(-\delta) \int_0^{+\infty} [1 - \pi(y)]\, dF(y). \tag{5}$$

To summarize the results on individual voting decisions:

Proposition 1 *Informed voters with an income below some threshold vote L, while those with an income above this threshold vote R. The vote of uninformed voters does not depend on their incomes, but only on the aggregate popularity shock δ and idiosyncratic taste shocks σ_i.*

Income affects voting behavior, both by making voters less favorable to redistribution, and by increasing the probability of the voter being informed.

Corollary 1 *i) Overall, voters with a higher income have a greater probability of voting for right wing parties. ii) The effect of income on voting is stronger if a given voter has greater political knowledge (as this increases the likelihood of being "informed").*

2.4 Political equilibrium

We are now ready to study the political equilibrium. Party L's total vote share is $V^I(\tau_L, \tau_R, \delta) + V^{NI}(\delta)$. There is a critical level $\hat{\delta}(\tau_L, \tau_R)$ such that L wins if and only if the observed $\delta < \hat{\delta}$. This critical level is found as the solution to

$$V^I(\tau_L, \tau_R, \hat{\delta}) + V^{NI}(\hat{\delta}) = 1/2. \tag{6}$$

The effect of a change in the proposed tax rate on this critical level is given by

$$\frac{\partial \hat{\delta}}{\partial \tau_L} = -\frac{V_{\tau_L}^I}{V_\delta^I + V_\delta^{NI}} = \int_0^{+\infty} \frac{\partial U}{\partial \tau_L} \mu(y)\ dF(y),$$

where subscripts denote partial derivatives, and the weighting function μ is defined by

$$\mu(y) = \frac{s\left[U\left(\tau_L, y\right) - U\left(\tau_R, y\right) - \hat{\delta}\right]\pi(y)}{\int_0^{+\infty}\left(s[U\left(\tau_L, y\right) - U\left(\tau_R, y\right) - \delta]\pi(y) + s(-\delta)[1-\pi(y)]\right)\ dF(y)} \geq 0, \tag{7}$$

where s is the first derivative (i.e. the pdf) of S.

Note first that for the average voter $\partial U/\partial \tau_L < 0$ in the relevant range of τ_L (i.e. for τ_L being somewhere between the social optimum and L's bliss point). Further, notice that for a given income, the numerator of equation (7) is the responsiveness of the vote share stemming from utility changes due to tax changes. The denominator is an adjustment yielding the effect of the critical value $\hat{\delta}$ on the vote share.

Party L's probability of winning the election is

$$P\left(\tau_L, \tau_R\right) = Pr\left[\delta < \hat{\delta}(\tau_L, \tau_R)\right] = H[\hat{\delta}(\tau_L, \tau_R)], \tag{8}$$

and we have

$$\frac{\partial P\left(\tau_L, \tau_R\right)}{\partial \tau_L} = h[\hat{\delta}(\tau_L, \tau_R)] \int_0^{+\infty} \frac{\partial U}{\partial \tau_L} \mu(y)\ dF(y). \tag{9}$$

where h is the first derivative (i.e. the pdf) of H, and μ is as defined in equation (7).

A change in party L's platform affects voting behavior in all income groups. There are three factors that affect how much the changed behavior in each group affects overall winning probabilities: How much the group's utility is changed by the change in platform, given by $\frac{\partial U}{\partial \tau_L}$, the group's leverage on $\hat{\delta}$ given by $\mu(y)$, and finally the group's size.

This implies that when politicians consider the effect on their winning prospects of a change in platform, they ultimately only respond to a "listening" electorate with incomes distributed according to $\mu\left(y\right) f\left(y\right)$. As we see below, when π is increasing in y, this implies that parties put more weight on voters from the upper part of the income distribution than under uniformly distributed information.

Rearranging equation (3) we find that the optimal choice of τ_L satisfies

$$-\frac{\partial P(\tau_L, \tau_R)}{\partial \tau_L} \frac{\tau_L}{P(\tau_L, \tau_R)} = \frac{\partial U(\tau_L, y_L)}{\partial \tau_L} \frac{\tau_L}{U\left(\tau_L, y_L\right) - U\left(\tau_R, y_L\right) + Z}. \tag{10}$$

The left hand side of the expression corresponds to the effect of a policy change on the probability of winning the election whereas the right hand side represents the utility gain of the politician of changing the policy. We see that the optimal policy is where the elasticity

of the winning probability with regard to the policy equals that of the party's utility gain.

Interestingly, as the support from the uninformed voters does not depend on the actual platforms selected, they will be treated as a constant by the parties. Thus, despite the additional uncertainty in our model, the optimization decision of the parties becomes analogous to the one in the framework of Wittman (1983). Hence, his proof of existence of a Nash equilibrium (1983: 154f) also applies to our setting. Besides for non-generic special cases this framework always features some platform divergence.

2.5 The distribution of information

To see the effect of unevenly distributed information, a natural benchmark is the case where $\pi(y) = 1$, so that all voters are informed. This corresponds to the classic Wittman (1983) model and is an implicit assumption in most electoral models. Compare it first to a situation where only some voters are informed, but where the probability of being informed is independent of income, i.e. $\pi(y) = \pi_0$. Label the left hand side of (10) $\mathcal{E}^P$. This is the elasticity of the winning probability with regard to the proposed platform. If $\mathcal{E}^P$ decreases, it means that party L has a better position and can to a larger extent choose a policy it desires itself, i.e. a higher tax rate τ_L. Combining (8) and (9), we obtain

$$\mathcal{E}^P = -\frac{\partial P(\tau_L, \tau_R)}{\partial \tau_L} \frac{\tau_L}{P(\tau_L, \tau_R)} = -\tau_L \frac{h(\hat{\delta})}{H(\hat{\delta})} \int_0^{+\infty} \frac{\partial U}{\partial \tau_L} \mu(y)\ dF(y), \tag{11}$$

where as before $\mu(y)$ is given by equation (7).

At $\pi_0 = 0$, i.e. with no informed voters, we see that $\mathcal{E}^P = 0$, so party L chooses τ_L to maximize their own utility without any attention paid to voters. Similarly, party R chooses their platform to maximize their own utility.

At $\pi_0 = 1$, the weight $\mu(y) > 0$, which means that voters are taken into account. At party L's bliss point, we have $\mathcal{E}^P > 0$ as by assumption this policy is above the one preferred by the average voter (i.e. $\partial U/\partial \tau_L < 0$ for most voters). Hence party L's proposed platform is closer to the average preferred policy than when $\pi_0 = 0$.

Although $\mathcal{E}^P > 0$ for all $\pi_0 > 0$, it is not necessarily maximized at $\pi_0 = 1$. The reason for this is that an increase in π_0 changes $\hat{\delta}$, increasing it if a majority of formerly uninformed voters decide to vote L when they get informed[9] and vice versa. This may in itself improve L's position (increase $P(\tau_L, \tau_R)$) enough that it can move back towards its bliss point. However, as only one party can have its position improved, at least one of the parties chooses a less polarized platform for a higher π_0. See Appendix A.2 for further discussion of this. To summarize, we obtain the following Proposition:

[9]Whether this is the case depends on y_L, y_R, the utility function, as well as the exact shape of F. A derivation of sufficient conditions for this to be true is outside the scope of the present paper.

Proposition 2 *When some voters are uninformed, but information is unrelated to income levels, at least one of the parties' policy becomes more "polarized" than with perfect information, i.e. further away from the social optimum.*

Let us now introduce a probability of being informed that is increasing in income. Consider the effect of making some poor informed voters non-informed and the same number of rich non-informed voters informed. We do this by perturbating the π function, and hence the fraction of informed voters with income y is $\pi(y) + \alpha\nu(y)$ where $\nu(y) \leq 0$ for y below some threshold and $\nu(y) \geq 0$ for y above. The total number of informed voters is kept unchanged, i.e. $\int_0^{+\infty} \nu(y)\ dF(y) = 0$.

The following lemma shows that for a small perturbation party L chooses a more right wing platform:

Lemma 1 $\mathcal{E}^P$ *is increasing in* α.

The proof is given in Appendix A.3. There are two effects: First, the critical value $\hat{\delta}$ goes down as the group of informed rich voters generally favoring party R increases. This weakens L's position, which consequently pays less attention to own preferences in the aim of regaining popularity. Second, the weight $\mu(y)$ changes, placing more emphasis on rich voters. Both these effects induce L to propose a more right wing platform. The same two forces also make party R move its platform to the right. To summarize, we obtain the following Proposition:

Proposition 3 *When some voters are uninformed, the more information depends on income, the more right wing the platforms of each of the parties become.*

This has the following empirically testable implication:

Corollary 2 *The higher the correlation between income and information, the less redistributive are the platforms of both parties.*

3 Information and voting behavior

3.1 Data

To test the predictions of the model we use data from the American National Election Studies, containing information from individual interviews from 1960 to 2004. First we use a number of indicators of how well informed the respondent is about public policy in general and the electoral campaign in particular. We have 3-points and 4-points scales on how interested the respondent is in the election and in public affairs in general and binary

variables on whether she followed the campaign on TV, on radio, and in the newspapers. A factor analysis of these indicators reveals that there is a single very strong factor, pointing out the scope for data reduction. Therefore, we use a principal component analysis to reduce the five indicators to a single indicator of how informed the respondent is, which is the main indicator of information used in the analysis.

To measure political behavior we mostly rely on voting in presidential elections as this is perfectly comparable across states, although we also analyze voting in congressional elections in some robustness checks. We only consider voting for the two major parties in order to assure comparability over time. Further, data on the respondent's stand on a number of policy issues as well as the usual vector of background variables are included. A full description of the data is provided in Appendix B.1, and Appendix C provides descriptive statistics.

3.2 Who are informed?

Assumption 2 implies that more educated voters with higher income are better informed about politics than those with less education and lower income. To check if this holds, Table 1 displays the results from estimations where the indicators of being politically informed are regressed on income and education, as well as on a vector of explanatory variables and year and state dummies. We first use the five individual indicators of being informed, then the composite measure from the principal component analysis with and without state fixed effects.

For all specifications we obtain the expected result that voters with higher income and more education tend to be better informed. These results are in most cases significant at the 1% level. Moving from the lowest to the highest level of education increases the level of information by 1.07 standard deviations whereas an increase from the lowest to the highest income category increases information by 0.37 standard deviations.[10]

3.3 Income and voting

The core of Proposition 1 and Corollary 1 is that income is a better predictor of voting behavior for more informed voters than for less informed voters. A simple way to test this is to regress observed voting on the interaction of income and information, obviously also controlling for background variables. Results from this estimation are shown in Table 2. Columns (1) and (2) display the results from a probit model without and with state fixed effects, while Column (3) presents the results from an ordinary regression on a binary outcome variable. All methods confirm that a rise in income increases the probability of

[10] Both results are based on the numbers in Column (7) of Table 1.

Table 1: The determinants of being informed

	(1) Interest in campaign	(2) Interest in public affairs	(3) Followed campaign on TV	(4) Followed campaign on radio	(5) Followed campaign in newspapers	(6) Informed	(7) Informed
Income	0.0801***	0.0675***	0.110***	0.0175**	0.119***	0.106***	0.108***
	(13.16)	(10.36)	(11.58)	(2.06)	(13.23)	(10.65)	(10.69)
Education							
9-12 grades	0.259***	0.404***	0.253***	-0.0217	0.530***	0.463***	0.467***
	(11.85)	(16.23)	(7.60)	(-0.70)	(16.89)	(11.89)	(11.95)
12 grades + diploma	0.479***	0.610***	0.297***	-0.0654**	0.803***	0.737***	0.742***
	(22.66)	(25.58)	(9.10)	(-2.18)	(25.87)	(19.85)	(19.86)
12 grades, diploma, and training	0.641***	0.818***	0.377***	0.167***	0.954***	1.044***	1.042***
	(24.12)	(27.52)	(9.32)	(4.57)	(24.39)	(24.16)	(23.98)
Some college	0.799***	0.963***	0.432***	0.215***	1.122***	1.265***	1.261***
	(34.51)	(37.45)	(12.04)	(6.65)	(32.53)	(32.22)	(31.82)
BA	0.961***	1.193***	0.462***	0.351***	1.386***	1.540***	1.535***
	(37.47)	(42.00)	(11.48)	(9.89)	(34.78)	(35.82)	(35.46)
Advanced degree	0.980***	1.312***	0.405***	0.422***	1.545***	1.576***	1.570***
	(28.80)	(36.26)	(7.50)	(9.18)	(27.53)	(29.70)	(29.42)
Age	0.0250***	0.0317***	0.0229***	0.0102***	0.0337***	0.0505***	0.0513***
	(12.24)	(14.70)	(7.30)	(3.58)	(11.38)	(15.00)	(15.23)
Age squared	-0.000117***	-0.000159***	-0.000122***	-0.0000354	-0.000163***	-0.000284***	-0.000292***
	(-5.62)	(-7.28)	(-3.80)	(-1.22)	(-5.41)	(-8.29)	(-8.52)
Female	-0.147***	-0.347***	-0.0535***	-0.210***	-0.219***	-0.333***	-0.334***
	(-12.52)	(-27.40)	(-2.90)	(-12.84)	(-12.51)	(-17.14)	(-17.20)
African American	0.166***	0.0781***	0.0140	0.194***	-0.0728**	0.151***	0.144***
	(8.27)	(3.66)	(0.45)	(6.96)	(-2.55)	(4.66)	(4.28)
Other non-white	-0.0444*	-0.0685***	-0.116***	-0.0584	-0.110***	-0.140***	-0.153***
	(-1.74)	(-2.64)	(-3.00)	(-1.62)	(-3.03)	(-3.40)	(-3.61)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	No	Yes
Fit	0.0603	0.0739	0.104	0.0469	0.138	0.200	0.196
N	38704	31513	26887	25568	27297	18690	18689

*Notes: Columns (1) and (2) are ordered probits, (3), (4), and (5) probits, and (6) and (7) ordinary regressions. All specifications include year fixed effects and all but (6) state fixed effects. "Fit" is McFadden's ρ^2 in Columns (1) to (5) and R^2 in Columns (6) and (7). t-values are in parentheses, and *, **, and *** denotes significant at the 10%, 5%, and 1% levels.*

Table 2: The effect of income and being informed on Republican voting

	President			Congress
	(1)	(2)	(3)	(4)
Income	0.0943***	0.106***	0.0371***	0.0999***
	(6.28)	(6.92)	(6.93)	(6.94)
Informed	-0.103***	-0.0951***	-0.0335***	-0.0638**
	(-3.26)	(-2.99)	(-3.06)	(-2.10)
Income*Informed	0.0278***	0.0245**	0.00861**	0.0171*
	(2.83)	(2.46)	(2.51)	(1.84)
Model	Probit	Probit	OLS	Probit
State FE	No	Yes	Yes	Yes
Fit	0.102	0.116	0.126	0.0957
N	9723	9715	9722	11139

*Notes: Equations (1), (2) and (4) are probit estimations, equation (3) an ordinary regression. All specifications include age, age squared, sex, race, 7 dummies on educational level, and year dummies. Specifications (1), (3) and (4) also have state fixed effects. "Fit" is McFadden's goodness of fit-measure ρ^2 for the probits and R^2 for the OLS regression. t-values are in parentheses, and *, **, and *** denotes significant at the 10%, 5%, and 1% levels.*

voting republican, and this effect is stronger for the more informed than for the less informed voters. Going from the 25th to the 75th percentile on the level of information increases the coefficient on income in the specification in Column (2) from 0.138 to 0.171, which corresponds to about a 24% increase in the impact. The results for voting for Congress reported in Column (4) are somewhat weaker, but similar in sign and magnitude.

Another way to study this pattern is to split the sample between voters with high and low levels of information. Results from this approach are reported in Table 3, where we have estimated a probit model with a number of demographic characteristics for the least and most informed halves of the sample. Most of the demographics have fairly similar effects in both specifications, but we notice again that income is a much more important determinant of voting for the more informed part of the sample, both with and without state fixed effects.

One competing explanation for these findings could be that what we label less informed voters could simply be voters who have larger social concerns, and hence vote less according to own needs. In Appendix D we show that if we take voting according to social preferences into account, less informed voters still vote less according to their stated preferences.

3.4 Voting versus abstention

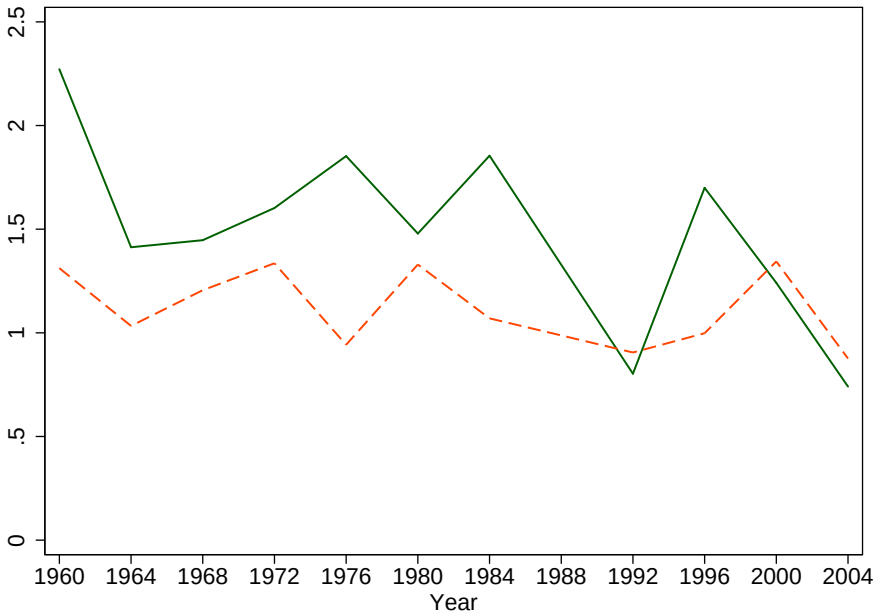
As highlighted by e.g. Larcinese (2005, 2007), there are both theoretical reasons and empirical support for the tendency of less informed voters to abstain more often from elections. It

Table 3: The effects of income and being informed: Split sample analyses

	(1)	(2)	(3)	(4)
Income	0.0562**	0.140***	0.0713***	0.148***
	(2.49)	(7.39)	(3.07)	(7.61)
Education				
9-12 grades	0.0969	0.222***	0.131	0.206**
	(1.17)	(2.58)	(1.55)	(2.36)
12 grades + diploma	0.235***	0.334***	0.273***	0.334***
	(3.02)	(4.29)	(3.42)	(4.22)
12 grades, diploma, and training	0.254***	0.447***	0.276***	0.448***
	(2.77)	(5.26)	(2.94)	(5.18)
Some college	0.441***	0.473***	0.490***	0.479***
	(5.11)	(5.95)	(5.55)	(5.93)
BA	0.471***	0.521***	0.515***	0.521***
	(4.88)	(6.35)	(5.23)	(6.25)
Advanced degree	0.278**	0.171*	0.296**	0.182*
	(2.19)	(1.81)	(2.27)	(1.89)
Age	0.00993	-0.00344	0.00809	-0.00447
	(1.30)	(-0.51)	(1.04)	(-0.65)
Age squared	-0.0000406	0.000101	-0.0000227	0.000109
	(-0.52)	(1.52)	(-0.29)	(1.62)
Female	-0.0576	-0.140***	-0.0539	-0.142***
	(-1.34)	(-3.92)	(-1.24)	(-3.94)
African American	-1.504***	-1.461***	-1.582***	-1.529***
	(-14.93)	(-16.63)	(-14.99)	(-16.95)
Other non-white	-0.354***	-0.165*	-0.339***	-0.192**
	(-3.88)	(-1.95)	(-3.54)	(-2.21)
Sample	Less informed	More informed	Less informed	More informed
Year FE	Yes	Yes	Yes	Yes
State FE	No	No	Yes	Yes
ρ^2	0.115	0.0998	0.134	0.115
N	4084	5639	4070	5634

*Notes: All specifications are probit estimations. "Less informed" is below median level of information whereas "More informed" is above median. ρ^2 is McFadden's goodness of fit measure. All specifications have year dummies, and specifications (3) and (4) also have state fixed effects. t-values are in parentheses, and *, **, and *** denotes significant at the 10%, 5%, and 1% levels.*

Figure 1: Simulation of the effect at the intensive and extensive margin



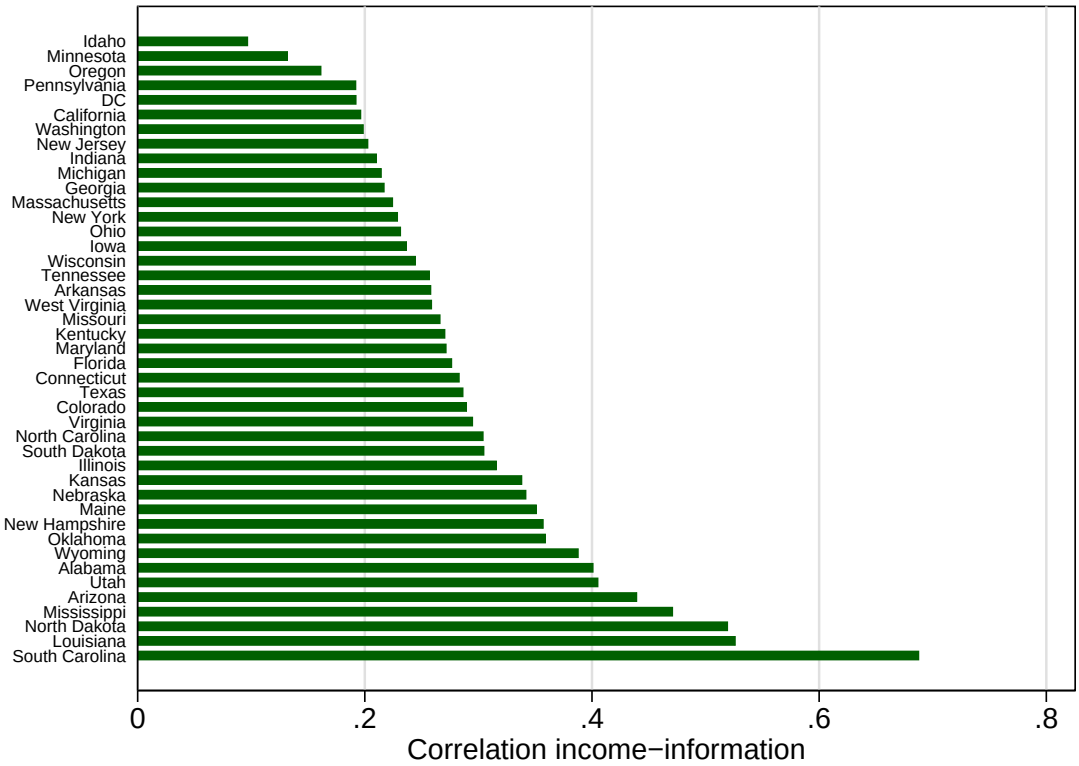
Notes: The simulation is based on the estimates reported in Column (1) of Table 2. The solid line is the simulated percentage point gain for the Democratic party from no voters abstaining; the dashed line is the simulated percentage point gain for the Democratic party from all voters having the maximum level of information.

might be that this effect completely overshadows our mechanism. To study this, we conduct a simulation based on the estimates from Column (1) in Table 2. We simulate the outcome of elections in two cases: First, if all voters had voted, where the voting pattern of those abstaining is predicted from the regression. Second, if all voters had the maximum level of information, again predicting voting behavior. The results are presented in Figure 1. We see that the gain for the Democratic party from all citizens voting is about 1.5 percentage points whereas the effect of the changed voting pattern from all voters being informed is somewhat smaller, at about one percentage point. Still, the effects of both channels are of approximately the same order of magnitude.

4 Information and political outcomes

Our theory predicts that when there is a strong positive correlation between income and the level of information, this reduces the equilibrium level of public goods provision. To get a grasp of the macro level effects of information, we study in this section the relationship between how information is spread and various political outcomes. All the data is described in detail in Appendix B.2.

Figure 2: Relationship between income and information by US state



Notes: Bars depict the average correlation between level of information and income by state.

Using the ANES data employed earlier, we can compute the correlation between the variables *Informed* and *Income* state by state and for various years.[11][12] The average correlations by state are shown in Figure 2. One approach would be to associate these with state policies. However, most redistributive policies are determined at the federal level, so state level policies tend to be uninformative. Instead, we focus on voting behavior in the House and the Senate.

In Table 4 we analyze whether a stronger correlation between information and income leads to less redistributive platforms for both Democrats and Republicans, as predicted by Corollary 2. It is not easy to get exact measures of voting behavior on redistributive issues completely isolated from all other issues. Instead, we rely on standard measures of political orientation, namely McCarty, Poole and Rosenthal's (Poole and Rosenthal, 1997; McCarty, Poole and Rosenthal, 1997) NOMINATE scores estimated from actual voting behavior as well as the scores collected by Americans For Democratic Action (ADA). These capture the political orientation of all Congress members from both parties. Right-wing political platforms are reflected by high NOMINATE scores and low ADA scores. Our final dependent variable is the tax share of personal income, which is a direct measure of how redistributive the final policy is. In Table 4 the coefficients of the variable *Correlation income-information* are displayed in three different panels. In panel A no additional controls are included, in panel B a battery of controls are included, and in panel C the same controls are included, together with state fixed effects.

Panel A of Table 4 shows that states with a high correlation between income and information do have more conservative representatives both measured by the NOMINATE and the ADA scores, and their tax share of personal income is lower than in states where this correlation is weaker. These findings are robust to including our battery of control variables. The findings using the NOMINATE scores are also robust to controlling for state fixed effects, but the ADA and tax share results are no longer significant when we only consider within state variation. This indicates that the findings are mostly driven by differences between states, although within state changes also have some effects on the political position of representatives. This pattern may be due to the fact that the correlation between information and income is rather persistent and evolves only slowly over time.

[11] ANES does not sample respondents in every state, hence some states are missing. Also, excluding states with few observations does not qualitatively change the results reported below.

[12] We have also tried to use the General Social Survey (GSS) to calculate these correlations. However, the best measure of information available in the GSS is frequency of newspaper readership, so this is less satisfactory. The results are comparable, but slightly less robust.

Table 4: Aggregate policy outcomes

	NOMINATE	ADA	Tax shares
A No controls	0.0907**	-11.27***	-0.627**
	(2.27)	(-2.73)	(-2.60)
R^2	0.0541	0.163	0.0600
B Controls	0.0932**	-8.260*	-0.445*
	(2.24)	(-2.00)	(-1.99)
R^2	0.303	0.412	0.319
C Fixed effects	0.0466*	-1.355	-0.133
	(1.68)	(-0.56)	(-1.03)
R^2	0.252	0.327	0.259
N	457	457	457

*Notes: The first row in each panel corresponds to the coefficient for the variable Correlation income-information. The following control variables are included: In Panel A Information, Income, and time effects. In Panel B all control variables of Panel A and in addition Personal Income, State population, Growth of personal income, Political competition, Share of non-farm income, Average Democratic vote share in the state. In Panel C all control variables from Panel B are included, but in addition state fixed effects. t-values clustered at the state level are in parentheses and *, **, and *** denotes significant at the 10%, 5%, and 1% levels.*

5 Conclusion

This paper has argued that "knowledge is power". Poorly informed voters do not perceive the party platforms correctly, and accordingly do not vote in their best economic interest. Such "noise voters" are disregarded by both the government and opposition, as they do not react to concessions and platform changes. Hence, the preferences of whole segments of the population remain ignored.

Whether the parties' strategic ignorance of the uninformed is a problem for a democracy depends on how information is spread in the society. If in all income classes and ethnic groups the proportion of poorly informed voters is roughly similar, we should not expect too severe biases in policies. Lack of information may in this case simply lead to more polarized party platforms, with parties putting a relatively higher weight on their preferred bliss point, given that pandering to voters is less lucrative if fewer people perceive it.

If however lack of political information strikes particularly the poor or people from particular ethnic groups, it could become a serious problem. In many contexts this is the case. Higher education results on average in higher income, and at the same time makes it easier to access and process political information. Hence, income and information tend to be systematically correlated, in some cases more and in some cases less. In societies where almost only the rich know about politics the preferences of the poor "noise voters" are barely taken into account by the political establishment and policies are catered towards the thin elite of the population who follows politics. Accordingly, the state becomes less redistributive and policies of all parties become more harmful to the poor. In societies with a smaller correlation between income and political information this bias is less severe. The mechanism would be similar for some ethnic minority group that may for various reasons be less informed about politics.

The irony of this is that the people who are most in need of the protection of the state, i.e. the uneducated ones with poor jobs, are least heard and accounted for by all parties (including the left-wing ones). The natural normative question to ask is whether the state should intervene to change this. One point of view could be that the poor are themselves to blame if they do not get their act together and if they "disenfranchise" themselves by lacking interest in politics. Things seem however more complex. The bias from badly informed poor voters may well end up being self-reinforcing and becoming persistent. In societies where knowledge is spread very unevenly it may well be that the thin elite who dominates politics may not find it in their interest to build a costly system of good state schools, as they can afford to send their children to expensive private schools. This however reinforces the correlation between income and information in the following generation and the concentration of political power in the hands of the few accentuates. In contrast, in other societies political knowledge may initially be widely spread and available and the large

influence of the poor may promote large investments in high-quality public schooling, which generates a further democratization of knowledge. What seems certain is that there is plenty of scope for further research on this and related topics in the future.

References

American National Election Studies, 2010, dataset, www.electionstudies.org.

Anderson, Sarah, and Philip Habel, 2009, "Revisiting Adjusted ADA Scores for the U.S. Congress, 1947-2007", *Political Analysis* 17: 83-88.

Austen-Smith, David and Jeffrey Banks, 1996, "Information Aggregation, Rationality and the Condorcet Jury Theorem", *American Political Science Review* 90: 34-45.

Bagnoli, Mark, and Ted Bergstrom, 2005, "Log-concave probability and its applications." *Economic Theory* 26: 445-69.

Banks, Jeffrey S., 1990, "A model of electoral competition with incomplete information." *Journal of Economic Theory* 50: 309-25.

Baron, David P., 1994, "Electoral competition with informed and uninformed voters." *American Political Science Review* 88: 33-47.

Bartels, Larry, 1996, "Uninformed Votes: Information Effects in Presidential Elections", *American Journal of Political Science* 40: 194-230.

Besley, Timothy and Stephen Coate, 1997, "An economic model of representative democracy", *Quarterly Journal of Economics* 112: 85-114.

Besley, Timothy, Torsten Persson and Daniel Sturm, 2010, "Political Competition, Policy and Growth: Theory and Evidence from the United States", *Review of Economic Studies* 77: 1329-1352.

Chan, Jimmy, and Wing Suen, 2008, "A Spatial Theory of News Consumption and Electoral Competition", *Review of Economic Studies* 75: 699-728.

Corneo, Giacomo and Hans Peter Grüner, 2000, "Social limits to redistribution", *American Economic Review* 90: 1491-1507.

Della Vigna, Stefano and Ethan Kaplan, 2007, "The Fox News Effect: Media Bias and Voting", *Quarterly Journal of Economics* 122: 1187-1234.

Delli Carpini, Michael and Scott Keeter, 1996, *What Americans Know About Politics and Why It Matters*, New Haven, Yale University Press.

Downs, Anthony, 1957, *An Economic Theory of Democracy*, New York, Harper and Row.

Feddersen, Timothy and Wolfgang Pesendorfer, 1996, "The Swing Voter's Curse", *American Economic Review* 86: 408-24.

Feddersen, Timothy and Wolfgang Pesendorfer, 1997, "Voting Behavior and Information Aggregation in Elections with Private Information", *Econometrica* 65: 1029-58.

Feddersen, Timothy and Alvaro Sandroni, 2006, "Ethical Voters and Costly Information Acquisition", *Quarterly Journal of Political Science* 1: 287-311.

Gans, Joshua, and Michael Smart, 1996, "Majority voting with single-crossing preferences", *Journal of Public Economics* 59: 219-37.

Gerber, Alan S., Dean Karlan, and Daniel Bergan, 2009, "Does the Media Matter? A Field Experiment Measuring the Effect of Newspapers on Voting Behavior and Political Opinions." *American Economic Journal: Applied Economics*, 1: 35-52.

Gilens, Martin, 2001, "Political Ignorance and Collective Policy Preferences", *American Political Science Review* 95: 379-96.

Grossman, Gene M., and Elhanan Helpman, 1996, "Electoral competition and special interest politics", *Review of Economic Studies* 63: 265-286.

Gul, Faruk, and Wolfgang Pesendorfer, 2009, "Partisan politics and election failure with ignorant voters", *Journal of Economic Theory* 144: 146-74.

Harms, Philipp and Stefan Zink, 2003, "Limits to redistribution in a democracy: a survey", *European Journal of Political Economy* 19: 651-68.

Hirschman, Albert and Michael Rothschild, 1973, "The changing tolerance for income inequality in the course of economic development", *Quarterly Journal of Economics* 87: 544-66.

Hodler, Roland, Simon Loertscher, and Dominic Rohner, 2010, "Inefficient Policies and Incumbency Advantage", *Journal of Public Economics* 94: 761-767.

Larcinese, Valentino, 2005, "Electoral Competition and Redistribution with Rationally Informed Voters", *Contributions to Economic Analysis and Policy* 4: Issue 1, Article 4.

Larcinese, Valentino, 2007, "Does Political Knowledge Increase Turnout? Evidence from the 1997 British General Election", *Public Choice*, 131,:387-411.

Leip, David, 2010, "Atlas of US Presidential Elections", dataset, www.uselectionatlas.org.

Lind, Jo Thori, 2005, "Why is there so little redistribution?", *Nordic Journal of Political Economy* 31: 111-25.

Lind, Jo Thori, and Dominic Rohner, 2011, "Voting under uncertainty about candidates", mimeo, University of Oslo and University of Zurich.

Lindbeck, Assar and Jörgen Weibull, 1987, "Balanced-budget redistribution as the outcome of political competition", *Public Choice* 52: 273-97.

Lupia, Arthur, 1992, "Busy Voters, Agenda Control, and the Power of Information", *American Political Science Review* 86: 390-403.

Martinelli, César, 2006, "Would rational voters acquire costly information?", *Journal of Economic Theory* 129: 225-51.

McCarty, Nolan M., Keith T. Poole, and Howard Rosenthal, 1997, *Income Redistribution and the Realignment of American Politics.* Washington, DC: AEI Press.

McKelvey, Richard and Peter Ordeshook, 1985, "Elections with limited information: A

fulfilled expectations model using contemporaneous poll and endorsement data as information sources", *Journal of Economic Theory* 36: 55-85.

Meltzer, Allan and Scott Richard, 1981, "A rational theory of the size of government", *Journal of Political Economy* 89: 914-27.

Moene, Karl Ove and Michael Wallerstein, 2001, "Inequality, social insurance, and redistribution", *American Political Science Review* 95: 859-74.

Moene, Karl Ove and Michael Wallerstein, 2003, "Earnings inequality and welfare spending: A disaggregated analysis", *World Politics* 55: 485-516.

Oberholzer-Gee, Felix, and Joel Waldfogel, 2009, "Media Markets and Localism: Does Local News en Español Boost Hispanic Voter Turnout?" *American Economic Review* 99: 2120-28.

Olson, Mancur, 1965, *The Logic of Collective Action*, Cambridge MA, Harvard University Press.

Osborne, Martin and Al Slivinski, 1996, "A model of political competition with citizen-candidates", *Quarterly Journal of Economics* 111: 65-96.

Palfrey, Thomas and Keith Poole, 1987, "The Relationship between Information, Ideology, and Voting Behavior", *American Journal of Political Science* 31: 511-30.

Perotti, Roberto, 1996, "Growth, income distribution, and democracy: What the data say", *Journal of Economic Growth* 1: 149-87.

Persson, Torsten, and Guido Tabellini, 2000, *Political Economics: Explaining Economic Policy*, Cambridge, MA: MIT Press.

Piketty, Thomas, 1995, "Social mobility and redistributive politics", *Quarterly Journal of Economics* 110: 551-84.

Poole, Keith T, and Howard Rosenthal, 1997, *Congress : a political-economic history of roll call voting.* Oxford : Oxford University Press.

Roberts, Kevin, 1977, "Voting over income tax schedules", *Journal of Public Economics* 8: 329-40.

Roemer, John, 1998, "Why the poor do not expropriate the rich: an old argument in new garb", *Journal of Public Economics* 70: 399-424.

Roemer, John, 1999, "The Democratic Political Economy of Progressive Income Taxation", *Econometrica* 67: 1-19.

Rohner, Dominic, 2009, "Coup at the Polls: Information, Closeness of Elections and Bad Politicians", mimeo, University of Zurich.

Romer, Thomas, 1975, "Individual welfare, majority voting and the properties of a linear income tax", *Journal of Public Economics* 4: 163-85.

Strömberg, David, 2004a, "Radio's Impact on Public Spending", *Quarterly Journal of Economics* 119: 189-221.

Strömberg, David, 2004b, "Mass Media Competition, Political Competition, and Public Policy", *Review of Economic Studies* 71: 265-84.

Wittman, 1983, "Candidate Motivation: A Synthesis of Alternative Theories", *American Political Science Review* 77: 142-57.

Wittman, Donald, 1989, "Why Democracies Produce Efficient Results", *Journal of Political Economy* 97: 1395-424.

Appendix A Extensions and proofs

A.1 A formal model of political information

We consider a continuum of voters differentiated by their stock of human capital E_i. Each voter i has a utility function

$$U_i = x_i + \xi d_i + J(g), \tag{A-1}$$

where x_i is voter i's amount of private goods, d_i her level of political knowledge, and g the amount of public goods provided in society. The function J is assumed to be concave and increasing (i.e. $J_g > 0$ and $J_{gg} < 0$), and $\xi > 0$ is a parameter indicating how much citizens value information. As in standard political economics models (e.g. Persson and Tabellini, 2000) the voters' utility depends positively on both the private and public goods consumed. Here we also include the level of political knowledge of the voter.

The voter has an income y_i that is taxed at a rate τ. Post tax income is divided between consumption and investments into information acquisition s_i (e.g. cost of buying books and magazines, the opportunity cost of watching the news etc), yielding a budget constraint

$$(1 - \tau)y_i = x_i + s_i. \tag{A-2}$$

Voter i's income is given by the production function

$$y_i = f(E_i), \tag{A-3}$$

which is increasing in E_i. Finally, we represent the generation of political knowledge by

$$d_i = \kappa(s_i, E_i), \tag{A-4}$$

where we assume $\kappa_s > 0$ and $\kappa_{ss} < 0$. We also assume that human capital and investments in political knowledge are complementary, i.e. $\kappa_{sE} > 0$.

The citizens make their optimal choices of s_i^* and g_i^* at the beginning of the first period. These choices are independent of the actions in the remainder of the game. Inserting equations (A-2) and (A-4) into equation (A-1), and using the government budget constraint

$g = \tau y$, where y = average income, we obtain the objective function for the citizens to optimize:

$$U^i = (y - g)\frac{y_i}{y} + \xi\kappa(s_i, E_i) - s_i + J(g). \tag{A-5}$$

The first order conditions with respect to s_i lead to lemma 2. The second order conditions hold.

Lemma 2 *More educated citizens have greater incentives to invest income in the generation of political knowledge, i.e. they have a higher s_i. They acquire higher levels of political knowledge than less educated citizens, i.e. they achieve a higher d_i.*

This result follows from $\kappa_{sE} > 0$.

Thus, education does not only increase income, but also results in higher levels of political knowledge acquired. Furthermore, each citizen derives her preferred level of g_i^*. Maximizing (A-5) with regard to g, we find the preferred level of public goods g^* characterized by

$$g_i^* = J_g^{-1}\left(\frac{y_i}{y}\right) \tag{A-6}$$

Lemma 3 *Richer voters (i.e. with higher y_i) prefer lower levels of the public good (i.e. lower g_i^*).*

The concavity of $J(\bullet)$ implies that equation (A-6) directly leads to this result (cf. Persson and Tabellini (2000) for a further discussion).

Combining these two lemmata, we can describe the relationship between preferred policies and political knowledge by a function $d^*(g^*)$, where d^* must be decreasing in g^*. High individual benefits from redistribution are on average associated with low levels of political information.

A.2 Increased information

To study the effect of increased information, we differentiate (11) with regard to π_0:

$$\frac{\partial \mathcal{E}^P}{\partial \pi_0} = -\tau_L \int_0^{+\infty} \frac{\partial U}{\partial \tau_L}\left(\frac{\partial \frac{h(\hat{\delta})}{H(\hat{\delta})}}{\partial \hat{\delta}}\frac{\partial \hat{\delta}}{\partial \pi_0}\mu(y) + \frac{h(\hat{\delta})}{H(\hat{\delta})}\frac{\partial \mu(y)}{\partial \pi_0}\right) dF(y). \tag{A-7}$$

There are two effects of an increase in π_0, corresponding to the two terms in parenthesis . First, more voters become aware of the parties' platforms and hence make a judgment based on their policy preferences. This has an effect on the critical $\hat{\delta}$, and corresponds to the first part of the parenthesis. The sign of this effect is unclear. $\hat{\delta}$ is increasing in π_0 if the average

voter tends to vote L when she goes from uninformed to informed.[13] When this is the case, an increased information level is an advantage for party L and a disadvantage for R.

Second, when more voters are informed, a change in policy platforms has a larger impact on voting behavior, corresponding to the last part of the parenthesis. As $\mu(y)$ is unambiguously increasing in π_0 for all y, this effect increases $\mathcal{E}^P$. If the second effect dominates, an increase in the fraction of informed voters π_0 tends to increase $\mathcal{E}^P$ and hence make both parties less polarized. If the first effect dominates, the party gaining in popularity from increased information can use its improved position to propose a platform closer to its bliss point, whereas the other party proposes a platform closer to the centre.

A.3 Proof of Lemma 1

We obtain

$$\frac{\partial \mathcal{E}^P}{\partial \alpha} = -\tau_L \left(\frac{\partial \frac{h(\hat{\delta})}{H(\hat{\delta})}}{\partial \hat{\delta}} \frac{\partial \hat{\delta}}{\partial \alpha} \right) \int_0^{+\infty} \frac{\partial U}{\partial \tau_L} \mu(y)\ dF(y) - \tau_L \frac{h(\hat{\delta})}{H(\hat{\delta})} \int_0^{+\infty} \frac{\partial U}{\partial \tau_L} \frac{\partial \mu(y)}{\partial \alpha}\ dF(y).$$

As we can always redefine $\widetilde{\pi}(y) = \pi(y) + \alpha\nu(y)$, it suffices to show that the lemma holds at $\alpha = 0$. We have

$$\left.\frac{\partial \hat{\delta}}{\partial \alpha}\right|_{\alpha=0} = \frac{\int_0^{+\infty} \left(S\left[U(\tau_L, y) - U(\tau_R, y) - \hat{\delta}\right] - S\left(-\hat{\delta}\right) \right) \nu(y)\ dF(y)}{\int_0^{+\infty} \left(s\left[U(\tau_L, y) - U(\tau_R, y) - \hat{\delta}\right] \pi(y) + s(-\hat{\delta})[1 - \pi(y)] \right)\ dF(y)} < 0.$$

This expression is negative, as $S\left[U(\tau_L, y) - U(\tau_R, y) - \hat{\delta}\right] - S\left(-\hat{\delta}\right)$ is positive for low income voters on which ν puts negative weight, and negative for high income voters on which ν puts positive weight.[14] Given that $\partial\left(\frac{h(\hat{\delta})}{H(\hat{\delta})}\right)/\partial\hat{\delta} < 0$, and that for the average voter $\partial U/\partial \tau_L < 0$, we know that the first term of $\partial \mathcal{E}^P/\partial\alpha$ is always positive.

A second effect is through changes in the weighting μ. The effect of a minor perturbation on μ depends on y: If for some y^* there is $\left.\frac{\partial \mu(y^*)}{\partial \alpha}\right|_{\alpha=0} > 0$ then it is also positive for all $y > y^*$ and vice versa. Hence more weight is now put on wealthier voters and less on poorer voters. Hence, also the second term of $\partial \mathcal{E}^P/\partial\alpha$ is always positive. Party L will thus unambiguously select a less polarized platform. For the same reasons also R will move to the right.

[13] Which is whenever $\int_0^{+\infty} \left(S[U(\tau_L, y) - U(\tau_R, y) - \delta] - S[-\delta]\right)\ dF(y) > 0$.

[14] If $S\left[U(\tau_L, y) - U(\tau_R, y) - \hat{\delta}\right] - S\left(-\hat{\delta}\right)$ is positive for all y for which $\nu(y) \neq 0$ the result is unchanged, as by assumption it is more positive when $\nu(y)$ is negative and vice versa.

Appendix B Data

B.1 Data used in Section 3

All data are from the American National Election Studies (2010).

African American: This is 1 when "race" is "black" and 0 otherwise, based on observation and/or self-declaration.

Age: Answer to question about date of birth.

Education: Answer to question about the highest degree earned. There are seven categories: 1) 8 grades or less ('grade school'), 2) 9-12 grades ('high school'), no diploma/equivalency, 3) 12 grades, diploma or equivalency, 4) 12 grades, diploma or equivalency plus non-academic training, 5) Some college, no degree; junior/community college level degree (AA degree), 6) BA level degrees, 7) Advanced degrees incl. LLB.

Female: Takes a value of 1 if female, 0 otherwise.

Followed campaign on newspapers: Answer to the question "Did you read about the campaign in any newspaper?". Takes value of 1 if answered "Yes, read newspaper(s) about the campaign", takes value of 0 if answered "No, read no newspapers about the campaign".

Followed campaign on radio: Answer to the question "Did you listen to any speeches or discussions about the campaign on the radio?". Yes=1, No=0.

Followed campaign on TV: Answer to the question "Did you watch any programs about the campaigns on television?". Yes=1, No=0.

Income: Based on self-declaration. There are five income groups: 1) 0 to 16 percentile, 2) 17 to 33 percentile, 3) 34 to 67 percentile, 4) 68 to 95 percentile, 5) 96 to 100 percentile.

Informed: Composite measure obtained from principal component analysis, explained in section 3.2.

Interest in campaign: Answer to question "Some people don't pay much attention to political campaigns. How about you, would you say that you have been/were very much interested, somewhat interested, or not much interested in the political campaigns (so far) this year?". Three categories of answers: 1) Not much interested, 2) Somewhat interested, 3) Very much interested.

Interest in public affairs: Answer to the question "Would you say you follow what's going on in government and public affairs most of the time, some of the time, only now and then, or hardly at all?". Four categories of answers: 1) Hardly at all (1960, 1962: not much at all), 2) Only now and then, 3) Some of the time (1960, 1962: fairly closely), 4) Most of the time (1960, 1962: very closely).

Other non-white race: This is 1 when "race" is "other" and 0 otherwise, based on observation and/or self-declaration.

Voted republican for Congress: Answer to the question "Did you vote for a candidate for the U.S. House of Representatives? (IF YES:) Who did you vote for?". Republican=1, Democrat=0.

Voted republican for President: Answer to the question "Major party presidential vote (2 party)". Republican=1, Democrat=0.

B.2 Data used in Section 4

ADA: Adjusted ADA scores, from Anderson and Habel (2009).

Average Democratic vote share in the state: From Besley, Persson and Sturm (2010).

Correlation income-information: Correlation between *Income* and *Information,* as described in the main text.

Election results: Actual results from elections. From Leip (2010).

Growth of personal income: From Besley, Persson and Sturm (2010).

Income: From ANES, cf. above.

Information: From ANES, cf. above.

NOMINATE: Data taken from Keith Poole's web page `http://voteview.com`. Procedure documented in McCarty, Poole and Rosenthal (1997).

Personal income: From Besley, Persson and Sturm (2010).

Political competition: Measure of political competition, from Besley, Persson and Sturm (2010).

Share of non-farm income: From Besley, Persson and Sturm (2010).

State population: From Besley, Persson and Sturm (2010).

Tax share: Taxes paid as share of personal income, from Besley, Persson and Sturm (2010).

Voted Republican for President: From ANES, cf. above.

Appendix C Descriptive statistics

Table A-1: Descriptive statistics

	All				Democrat		Republican	
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Mean	Std. Dev.
Age	45.76	17.15	17	99	46.70	16.51	47.30	16.32
Age squared	2388	1718	289	9801	2453	1664	2503	1657
Female	0.56	0.50	0	1	0.57	0.50	0.53	0.50
African American	0.11	0.31	0	1	0.17	0.37	0.02	0.13
Other non-white	0.06	0.24	0	1	0.06	0.23	0.04	0.19
Income								
Group 1	0.17	0.38	0	1	0.15	0.35	0.10	0.30
Group 2	0.17	0.37	0	1	0.18	0.38	0.14	0.35
Group 3	0.32	0.47	0	1	0.33	0.47	0.31	0.46
Group 4	0.28	0.45	0	1	0.30	0.46	0.35	0.48
Group 5	0.06	0.23	0	1	0.04	0.21	0.10	0.30
Education								
8 grades or less	0.16	0.37	0	1	0.16	0.37	0.11	0.32
9-12 grades	0.14	0.35	0	1	0.14	0.34	0.11	0.31
12 grades + diploma	0.25	0.43	0	1	0.24	0.43	0.22	0.41
12 grades, diploma, and training	0.08	0.28	0	1	0.09	0.29	0.11	0.31
Some college	0.19	0.39	0	1	0.18	0.38	0.21	0.41
BA	0.13	0.33	0	1	0.13	0.34	0.18	0.38
Advanced degree	0.05	0.21	0	1	0.06	0.24	0.05	0.23
Interest in the election	2.04	0.75	1	3	2.26	0.71	2.27	0.70
Interest in public affairs	2.78	1.02	1	4	2.94	0.94	3.03	0.92
Followed campaign on TV	0.77	0.42	0	1	0.87	0.34	0.86	0.35
Followed campaign on radio	0.44	0.50	0	1	0.47	0.50	0.50	0.50
Followed campaign in newspapers	0.69	0.46	0	1	0.77	0.42	0.79	0.41
Informed	0.00	1.46	-3.56	2.08	0.38	1.26	0.47	1.22
Voted republican for Congress	0.44	0.50	0	1	0.14	0.35	0.74	0.44
Voted republican for President	0.52	0.50	0	1				

Appendix D Taste variation and the level of information in a spatial model of voting

One explanation for the findings in Section 3.3 could be that what we label less informed voters could simply be voters who have larger social concerns, and hence vote less according to own needs. To test this, an extension of Proposition 1 would be that personal political position is a better predictor of voting behavior for more informed voters. To test this, we

assume that the voter and the two parties R and D are located in a policy space. The voter's position is g_i and the parties are located at g^R and g^D. Voter i will vote for party R if he is closer to R than to D. To capture nonpolitical effects, we also introduce stochastic terms ε, so he votes R if

$$\left\|g_i - g^R\right\| + \sigma_i \varepsilon_i^R < \left\|g_i - g^D\right\| + \sigma_i \varepsilon_i^D. \tag{A-8}$$

where $\|\cdot\|$ is some metric on the policy space[15]. We interpret a low value of σ_i as the level of information being high. To estimate this relationship, we employ a reduced form where we estimate that the probability of voting Republican is

$$\Pr(\text{Vote Republican}) = \Pr\left(\beta' g_i + \sigma_i \varepsilon_i\right)$$

where β_t is a time specific vector incorporating the relevant position of the parties. The variance is modeled as

$$\ln \sigma_i^2 = \gamma_t I_i \tag{A-9}$$

where I_i corresponds to i's level of information. Assuming that $\varepsilon_i^A - \varepsilon_i^B \sim N(0,1)$, we can estimate the parameters of the model using a heteroskedastic probit model.

The interesting parameter here is γ_t, which gives the relationship between information and voting behavior. A negative γ_t indicates that the variance is lower for the more informed voters, and that their voting pattern is better predicted by stated political preferences, which we can take as an extension of Proposition 1. The results are reported in Table A-2. Note that γ_t is negative for all years studied but two. As the estimates are not very precise, we have also made a joint estimate, i.e. where we assume γ constant over time. This joint coefficient is negative and clearly significantly different from zero.[16] Hence one's policy position has a more consistent impact on voting behavior for the more informed voters than for the less informed voters, which is in line with Proposition 1.

[15] Notice that this is not necessarily an Euclidean metric. Particularly, it may be reasonable to put more emphasis on distance in some dimensions than in others.

[16] The constraint that γ is equal between years changes the estimates of the upper part of the table as well (not displayed). The p-value for the constrained estimate is based on a LR test of $\gamma = 0$.

Table A-2: Political position and voting in a model of individual-specific variances

Year	γ	Z-value	Observations
1960	-0.053	-0.42	526
1964	-0.0592	-0.70	431
1968	0.0168	-0.13	358
1972	-0.102	-1.18	355
1976	-0.289**	-2.51	357
1980	-0.222**	-2.12	358
1984	0.0325	-0.22	278
1992	-0.0741	-0.56	312
1996	-0.0248	-0.36	557
2000	-0.633***	-2.62	162
2004	-0.0595	-0.71	478
All years	-0.104***	[.0005565]	

*Notes: All estimations are heteroskedastic probits with year specific parameters. The parameter "Common γ" is a joint maximum likelihood estimation with γ constrained to be equal for all years. z-values are in parentheses and p-values in square brackets, and *, **, and *** denotes significant at the 10%, 5%, and 1% levels.*