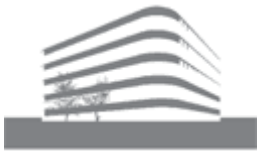

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RACISM AND REDISTRIBUTION IN THE UNITED STATES: A SOLUTION TO THE PROBLEM OF AMERICAN EXCEPTIONALISM

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*Abstract**

The two main political parties in the United States put forth policies on redistribution and on issues pertaining directly to race. We argue that redistributive politics in America can be fully understood only by taking account of the interconnection between these issues, and the effects of political competition upon the multi-dimensional party platforms. We identify two mechanisms through which racism among American voters decreases the degree of redistribution that would otherwise obtain. Many authors have suggested that voter racism decreases the degree of redistribution due to an *anti-solidarity effect:* that (some) voters oppose government transfer payments to minorities whom they view as undeserving. We point to a second effect as well: that some voters who desire redistribution nevertheless vote for the antiredistributive party (the Republicans) because that party's position on the race issue is more consonant with their own, and this, too, decreases the degree of redistribution. We call this the *policy bundle effect.* The effect of voter racism on redistribution is the sum of these two effects. We propose a formal model of multi-dimensional political competition that enables us to estimate the magnitude of these two effects, and estimate the model for the period 1976-1992. We numerically compute that during this period voter racism reduced the income tax rate by 11-18 percentage points; the total effect decomposes about equally into the two sub-effects. We also find that the Democratic vote share is 5-38 percentage points lower than it would have been, absent racism.

JEL Categories: D3, D7, H2

Keywords: Racism, redistribution, anti-solidarity effect, policy bundle effect, party unanimity Nash equilibrium, endogenous parties

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1. Introduction

It is an old theme of the Left that racism divides the American working class, thus blocking its attempt to redistribute national income away from capital towards labor.[1] Traditionally, the mechanism indicated has been that racism among workers weakens unions, which shifts revenues of firms towards profits and away from wages. A second mechanism, of more social democratic origins, operates through electoral politics. Racism reduces 'compassion' among citizens – particularly, in the United States, among whites towards blacks; some whites consequently vote against the redistributive party (the Democrats in the US), as blacks are prominent beneficiaries of redistributive taxation.

A renewed interest in the significance of voter racism is emerging among scholars. Alesina *et al.* (2001) regress, for a panel of countries, the degree of redistribution on the size of the country's poor ethnic minority, and find a strong negative relationship. The US has the most significant, poor minority of any country in the panel, and the least redistribution. These authors' explanation of the low level of American redistribution invokes *reciprocal altruism,* as defined by Bowles *et al.* (2001) and Gilens (1999). People support redistribution only when they believe that it conforms to norms of reciprocity and conditional obligation to others. Luttmer (2001) concludes similarly: individuals decrease their support for redistribution as the welfare recipiency rate in their community rises (an *exposure effect)* and the share of local recipients from their own racial group falls (a *group loyalty effect).* He finds that these effects are stronger if those on welfare are predominantly not working, or unmarried mothers.

Purely econometric exercises do not identify mechanisms; there could be many causes for the observed phenomenon. These authors conjecture they are capturing an effect in which citizens vote against redistribution because they place a low value on equality, due to their wish not to redistribute to minorities. There is, however, a second effect, quite different from this one, which may also be at play. Political parties put forth policies on many issues –in particular, on redistribution *and* on racial issues. (The latter include policies on affirmative action, government aid to blacks, 'law and order,' prison funding, and so on.) Racially conservative citizens who *desire* redistribution, because they themselves are poor, may vote for the Republican Party, because it has the policy they prefer on the race issue, even though it also advocates less

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[1] See McWilliams (1939) for a classical study of how growers used racism to prevent farm labor from organizing.

redistribution than these voters would like. This phenomenon is analyzed in Roemer (1998), although --in that article-- primarily at the theoretical level.

Here, we will attempt to measure these two effects of voter racism on redistribution, which we call the *anti-solidarity* and *policy bundle effects.* Due to the anti-solidarity effect, racist voters oppose redistribution to the poor, who (they believe) are substantially minority. By reducing voter compassion towards the poor, the anti-solidarity effect will cause both American political parties to be less redistributive than otherwise. Due to the policy bundle effect, some poor citizens may vote for the party that is anti-redistributive, even if they themselves desire some redistribution, because that party advocates a position on the racial issue consonant with their own. The policy bundle effect may further reduce redistribution.[2]

We denote by *voter racism* an affirmation of what are conventionally viewed as conservative policies on the race issue, induced by *anti-black affect* and *the belief that blacks are pushing too fast.* (See section 2 for the precise operational definition of voter racism.) This is not the old-fashioned, blatant Jim Crow racism.[3] We leave open the question of *why* the voter in question has the affect and the belief he/she does.

The policy bundle effect to which we refer may be large because there is no third party in the United States that offers voters a platform of significant redistribution *and* racially conservative policy: if there were, then poor racist voters desiring redistribution could vote for it, instead of voting Republican. The policy bundle effect is a *political portfolio effect:* it exists because of the limited choice of policy combinations available to the voter in a system with only two parties. The disappeared southern Democrats represented the platform just described; when these racist politicians were Democrats, Southern whites could vote Democratic (pro-redistribution) *and be* racially conservative at once. The policy bundle effect, we conjecture, was either nil or small during this period. One may conjecture that the demise of the Southern racist Democrat has reduced redistribution in the US –a conjecture we might be interested in testing at another time.

Some methodological comments are in order. Unlike Alesina *et al.* (2001) and Luttmer (2001), we will propose a formal model of political competition between parties. We will assume that the competition between the Democratic and Republican parties in the US is described by that model. We are interested in calculating the *magnitude* of the changes in redistribution that would occur, were

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[2] We point out, however, that the policy bundle effect of racism on redistribution is not always negative. Conceivably, if there were a large group of rich, anti-racist voters, the policy bundle effect could be positive. As we will see, this is not the case in the United States.

[3] We are concerned about racism of the majority towards minorities, which must be distinguished from 'group conflict' between races.

voter racism to be reduced. Observations on voting behavior and fiscal policy will be used to estimate the model's parameters and to construct their confidence intervals. With the benchmark model and the estimated model parameters in hand, we will perform some counterfactual experiments enabling us to compute the magnitude of the two effects of voter racism on redistribution. Sensitivity analyses and model confirmation procedures will be also employed. We attempt to provide micro-political foundations for the observation that voter racism reduces redistribution, and to put 'costs' on racism in the US, in terms of redistribution foregone.[4]

In the jargon of econometrics, our approach is *semi-parametric,* which means two things: first, that we estimate those parameters that appear in the functions explicitly specified in the model using parametric estimation methods; second, that other functional forms, for which economic and political theory provide little guidance, are estimated non-parametrically.[5] In particular, our use of non-parametrically estimated density functions in the computation of the model is sophisticated and computationally expensive, but greatly improves the model's fit.

Section 2 provides motivation for our paper. We start by considering the data, and present our operational definition of voter racism. We shall argue that the racial dimension has been important (and often more important than the income dimension) in electoral politics of the United States. Section 3 describes our micro-political model, one of political competition on a two-dimensional policy space where the constituencies of parties are endogenously determined. In section 4, we estimate the values of the underlying parameters as well as the distribution of voter types, using two sources of micro data, the Panel Study of Income Dynamics (PSID) and the National Election Studies (NES). In section 5, we calculate the equilibrium platforms of the two parties using the model described in section 3, with parameter values and functions estimated in section 4, and decompose the total effect of voter racism on redistribution into its two separate effects. We find that both the policy bundle and anti-solidarity effects of racism on fiscal policy are significant and negative in the United States in the period of 1976-1992. The total effect of racism is to reduce the marginal tax rate between 11 and 18 percentage points and this decomposes about

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[4] Although numerical computation methods have a long history in natural sciences, social scientists –both theorists and empirical scholars– have embraced them less enthusiastically. Perhaps one reason for the lack of enthusiasm is because parameter values and functions have been arbitrarily chosen (rather than estimated) and statistical testing procedures for studying the computed equilibria have not been provided (Hansen and Heckman, 1996). We overcome the first criticism by estimating parameter values explicitly and as accurately as possible. Regarding the second criticism, we note that recently developed bootstrapping methods allow researchers to compute standard errors of the equilibria even in complicated cases. We do not do this here, except for few simple cases, due to computation time limitations.

[5] An example of the former are the parameters associated with labor supply functions; an example of the latter is the distribution of voter types.

equally into the two effects. We show that the time trend of computed equilibrium platforms traces very closely that of actual historical data. Section 6 concludes. Tables and Figures discussed in the main text are gathered at the end of the paper. Appendix 1 includes other Figures and Tables not presented in the main body of the text. Appendix 2 describes the variables from the National Election Studies that we use in the paper. Appendix 3 describes the non-parametric estimation methods employed in estimating the distribution of voter types and some related asymptotic properties.

2. Recovering Voter Racism from Survey Data

The place of ethnic minorities, in particular, African Americans, in American society has been a controversial question throughout American history. From the time of chattel slavery, through the Civil War and the Civil Rights movement of the 1960s, racial issues have been on the political agenda. Racially tinged issues, such as welfare, crime, 'permissive' judges, and government regulation, have been the subject of strenuous political debate and strong legislation for the last three decades.

Various polls and many scholarly works clearly show that Americans have rapidly rejected the blatant 'biological' racism, so common half a century ago, that asserts the biological inferiority of minorities and calls for strict segregation. The racial caste system, which lasted for 350 years, was almost entirely dismantled in the 26 years following World War II.

But race as a political issue has hardly disappeared. Although Americans now overwhelmingly endorse formal racial equality, and much progress in the economic and social position of African Americans has been made in the last half century, significant inequality in the quality of life continues to exist, and American society is highly polarized about it; debates are fierce when 'race-conscious' remedies such as affirmative action are on the table, as seen in the *Bakke v. Regents of the University of California* case in 1978 and the *Hopwood v. Texas* case in 1996.

Race as a political issue has led to party and voter realignment in American politics. Carmines and Stimson (1989) argue that the emergence of racial desegregation as a partisan issue during the 1960s led to a gradual but profound transformation of the US party system. Two studies commissioned by the Michigan Democratic Party to investigate the cause of white male blue-collar defections from the party report that racial issues were a primary source of anti-Democrat anger among white blue-collar voters (Lipset, 1996; Teixera and Rogers, 2000). Edsall

and Edsall (1991) argue that "of the four interrelated issues -race, rights, party reform, and taxes- ... race has been the most critical, and the most powerful, in effecting political change... Racial attitudes became a central characteristic of both ideology and party identification, integral to voters' choices between Democrats and Republicans."[6]

Casual examination of vote share and party identification data confirms this view. (See Table A-2-1 and Figure A-2-1 in Appendix 1.)

According to the National Election Studies (NES), the support for the Democratic Party in the presidential elections of 1960 and 1964 (the Kennedy-Johnson era) was 60.48%. In particular, 61.76% of non-rich white voters (whose incomes are below the 67th percentile of the national income distribution) and 59.7% of the less-educated white voters (whose degrees are less than Bachelor's) voted for the Democratic Party. The fall in the support for the Democratic Party, in particular among white voters, is dramatic in the 1968 and 1972 elections. That fall is 23.24 percentage points in total, but 25.64 percentage points among white voters, 28.33 percentage points among non-rich Whites, and 27.18 percentage points among less-educated white voters.

Party identification data reveal a more dramatic picture. About 83 percent of Southern whites described themselves as Democrats in 1952; as of 1996, only 48 percent did. The decline of Democratic identification occurs not only for Southern whites; Northern whites have also gradually defected from the Democratic Party since 1964. Indeed in only one election since 1960 has the Democratic candidate received a majority of the total white vote.

In contrast to the percentage of white Democratic votes, the percentage of blacks voting Democratic has always been greater than 90%. Indeed the black vote is a pivotal factor for the Democratic Party in presidential elections. Black Republicans and black Democrats are remarkably similar, both demographically and in their policy preferences.[7]

This pattern of voting differences across races tells us little about voter racism; whites may have turned away from the Democratic Party because they oppose big government and the welfare state. (Abramowitz (1994) expresses one such view.) There is a significant variation of racial views among white voters, and trends of racial views shown in surveys differ greatly

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[6] Throughout the 1950s and early 1960s, Democrats and Republicans exhibited no consistent partisan differences on racial issues. Racial politics becomes salient only in 1963 when the Democratic Party, overcoming the resistance of its Southern wing, stepped out as the party of racial liberalism. In the 1964 presidential election, the Democratic candidate, Lyndon Johnson, stood squarely for federal intervention to break down the barriers of racial segregation, while the Republican candidate, Barry Goldwater, stood squarely against any use of federal power to achieve racial integration. Camines and Stimson (1989) demonstrate that, between the 1950s and the 1970s, there was a dramatic reversal in the positions of Democratic and Republican party leaders and activists on the issue of civil rights.

depending on the kind of question asked. Racism is a *latent* variable that cannot be easily identified from survey questions. How then do we understand white racism in politics?

Explaining whites' opposition to liberal racial policies has been the subject of extensive research by American social scientists over the past quarter century. Although details of this research are quite nuanced, the debates have mainly centered around the relative importance of two factors underlying American racial attitudes: (1) psychological antipathy/resentment, prejudice, and negative beliefs (including stereotyping) against minorities; and (2) political ideology and values such as individualism and libertarianism. Scholars have disputed which of these factors is the principal source of public's opposition to race-related policies, such as affirmative action programs.[8]

To address this question, we decompose 'political ideology' (liberal-conservative) of whites into four *orthogonal* latent factors - racism, libertarianism, feminism, and compassion for the poor - which we believe constitute core components of American political ideology, by carrying out factor analyses on ten variables in the NES for each presidential election year.[9]

These ten variables are: (1) *antiblack affect,* measured by the difference between a white respondent's thermometer rating of blacks and his rating of his own ethnic group; (2) the belief that *blacks are pushing too hard,* measured by the responses on the question of whether civil rights movement is pushing too fast; (3) thermometer rating towards *the poor* (4) thermometer rating towards *people on welfare;* (5) thermometer rating towards *trade unions;* (6) the belief that *government is too strong* to be able to respect individual responsibility and liberty; (7) the *lack of trust* in government; (8) thermometer rating towards the *women's liberation movement;* (9) perception about *equal role for women;* and (10) the scale of *political ideology* (a conservative-libertarian scale).[10]

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[7] Higher-income blacks are not more likely to vote Republican, as are their white counterparts. In the 1992 NES survey, for instance, every black earning $75,000 (N=23) voted for Clinton.

[8] See Kinder and Sanders (1996), Sniderman and Piazza (1993), and contributions in the volume edited by Sears, Sidanius and Bobo (2000).

[9] Political ideology is not *unidimensional.* One can for example be liberal in one dimension (e.g., pro-choice on abortion issues) but conservative in another dimension (e.g., opposition to redistribution). Researchers often use political ideology as a controlling variable in their regressions, and frequently find that political ideology is a strong predictor of voting pattern and attitude towards social policies. But to the extent that political ideology is a *mixture* of various political attitudes, it is not clear what can be inferred from a statistically significant coefficient on 'political ideology.' A similar point was made by Best (1999) about Stimson's (1999)'s 'policy mood' variable. By extracting four core components from the survey materials, we are decomposing the ambiguous concept of political ideology into orthogonal dimensions.

[10] Precise wordings for these variables are reported in Appendix 2. We chose an approximately equal number (two or three) of variables for each factor. Some better variables, in particular regarding libertarianism, are available in some years, but we are constrained to choose the variables that are available for all coverage years; otherwise our

Racism is defined as a factor loading highly on (1) and (2), compassion towards the poor loads highly on (3)-(5), libertarianism loads highly on (6)-(7), and feminism loads highly on (8)-(9).[11] All factors load on political ideology.

Four primary orthogonal factors emerge from our factor analysis. Which factor becomes the first component (i.e., the one which explains the most of variation of these ten variables) differs across years; nevertheless, four factors came out consistently from our factor analysis across all years (with eigenvalues ranging from 1.00 to 2.5), and these explain about 60% of the total variation of the 10 variables in each year. By construction, these factors are uncorrelated with each other and each has mean zero and standard deviation 1.[12]

We also decompose the political ideology of blacks into three factors (libertarianism, compassion, and feminism) using only (3)-(10) (we define blacks to be racism-free), but the discussion in this section will mainly focus on white voters.

Figure 2-1 shows the average factor scores for whites across regions and various demographic factors.[13]

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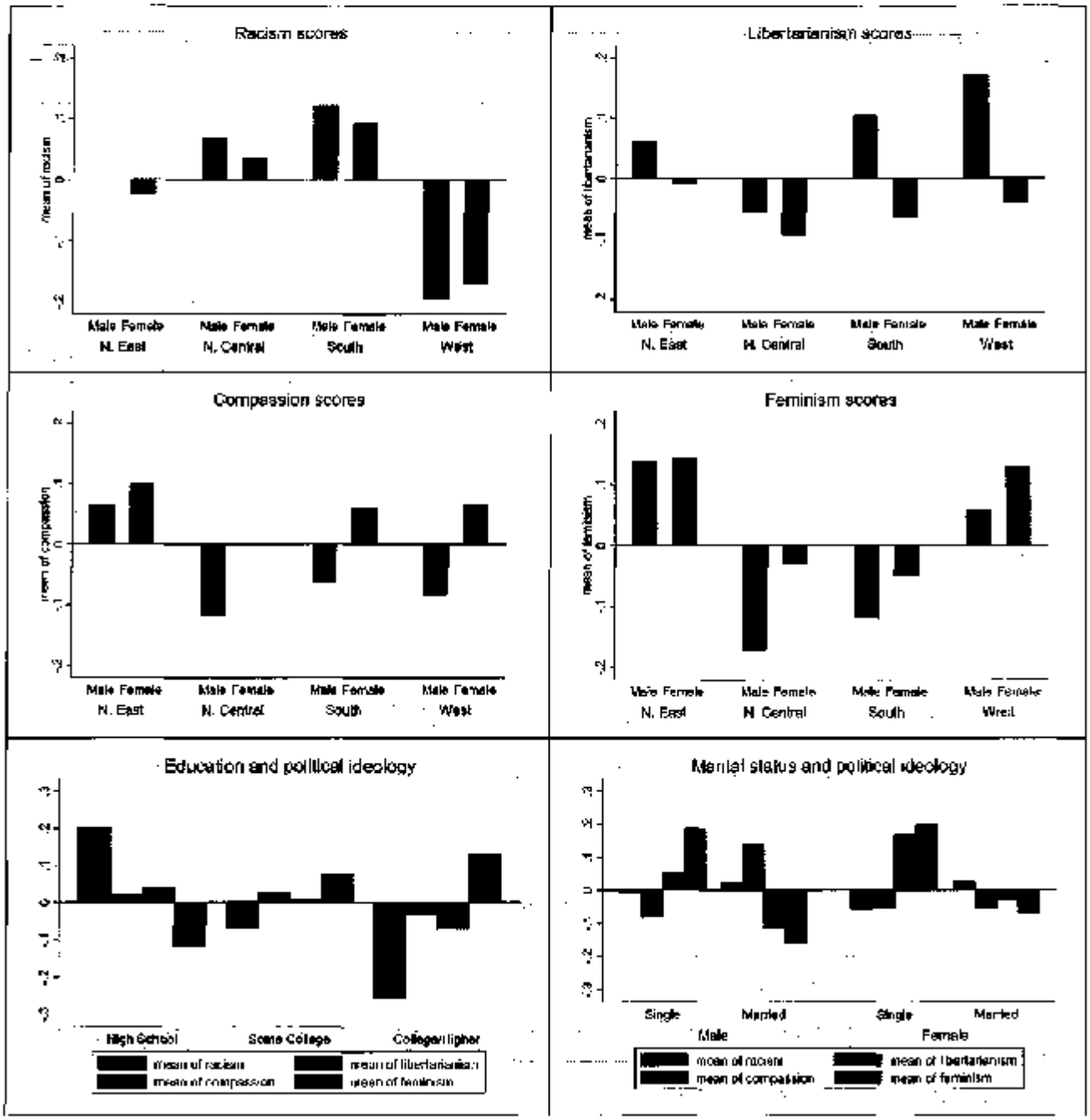
measurement will be inconsistent across years. Our choice of covered years is also, by and large, driven by the availability of these ten variables.

[11] We believe that our definition of racism is minimal and conservative. Anti-black affect and the perception that blacks are pushing too hard are the 'least common denominators' in almost all recent research on racism. We do not wish to call compassion *egalitarianism,* for compassion is neither sufficient nor necessary for egalitarianism. For instance, feminism can also be based on an egalitarian view. Conversely a person can be compassionate even if she rejects the egalitarian principle, perhaps, due to the disincentive effect of equality (e.g., 'compassionate conservatives'). Finally, egalitarianism is a complex view, which spans views from outcome egalitarianism to opportunity egalitarianism to an equal treatment principle.

[12] Factor loadings for white respondents in the two end years (1976 and 1992) after varimax rotation are reported in Table A-2-2 in Appendix 1. In 1992, for instance, the first factor loads very highly on the women's liberty thermometer and the women's equal role while loading very weakly on all other variables except political ideology. We call it feminism. The second factor loads highly on the poor thermometer, the welfare thermometer and the union thermometer. This factor therefore measures compassion. The third factor loads highly on the questions about whether the government is strong and about trust in government. In 1992, a lower value in this component is positively correlated with the belief that the government is too strong and the government cannot be trusted. We reverted the factor scores of this component (around 0) to get the libertarianism scores. (Recall that each factor has mean zero and standard deviation 1.) The fourth component is racism; it loads very highly on the antiblack affect and the belief that the civil rights movement is moving too fast. Interestingly, this factor loads negatively on the welfare thermometer although its loading is almost nil for the poor thermometer. This result is consistent with Gilens' (1999) observation that 'welfare,' 'AFDC' or 'food stamp' in the United States are 'code words' for blacks. Our factor analytic solution is robust. Factor scores obtained from an oblique solution (using promax rotation, not reported here) are nearly identical to those from the orthogonal solution (using varimax rotation).

[13] Because we computed factor scores year by year, they have mean zero and standard deviation 1 for all years. Average scores cannot be directly compared across years.

Figure 2-1: Comparison of political ideology across regional and demographic factors: Whites only (1976-1992) (Source: NES)



For both racism and feminism, the regional gap appears to be more important than the gender gap. Although females are more liberal than males on both racism and feminism, the bigger difference lies across regions, not genders; the West and the Northeast are racially liberal and feminist, while the Midwest and the South are racially conservative and anti-feminist. The pattern is different for compassion and libertarianism. In all regions, females are less libertarian and more compassionate than males.

Figure 2-1 also shows how these four factors are correlated with education and marital status. Note that education is negatively correlated with racism and positively correlated with feminism. As many authors argue, this is mainly because prejudice (towards minorities and women) is negatively correlated with the level of education. In the cases of compassion and libertarianism, on the other hand, the relationship between education and political ideology is either nil or non-existent. Marital status matters for compassion and feminism (singles are more liberal in both sexes) but not for racism and libertarianism.

Obviously bivariate correlations may not reveal the true correlation. Our multivariate regressions of four political factors on demographic factors, however, exhibit similar patterns. (See Table A-2-3 in Appendix 1.)

To see how these four factors affect various social attitudes of white voters, we ran various multivariate regressions. First, we ran regressions with six dependent variables tapping various aspects of racial attitude. Table 2-1 reports the regression results.[14]

Table 2-1 clearly shows that in all cases, racism is the single most important factor in explaining various racial attitudes in terms of the size of the coefficient and statistical significance. We learn that, in contrast to the popular political rhetoric, libertarianism plays very little role in explaining racial attitudes, except for aid-to-blacks. Consider, for example, column (4), which takes as the dependent variable the question asking whether 'blacks can get better off if they try harder.' A majority of white voters provide positive answers to this question, and based upon this observation, it is often argued that whites oppose racially liberal policies because they believe that

[14] When dependent variables take more than three different values, we run OLS regressions rather than ordered probit regressions, because ordered probit regressions are less robust than OLS when (unknown) error terms are not normally distributed. When dependent variables take more than three values, the choice between OLS and ordered probit regressions is usually arbitrary. Although we do not report the details here, ordered probit regressions do not change our results.

Table 2-1: Determinants of whites' racial attitudes (Source: NES)

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OPROB
	7pt aid-to-blacks scale 1=pro ... 7=con	conditions make it difficult for blacks 1=agree ... 5=disagree	blacks should not have special favors 1=agree ... 5=disagree	blacks must try harder 1=agree ... 5=disagree	blacks gotten less than they deserve 1=agree ... 5=disagree	how much has position of negro changed 1=not much ... 3=a lot
racism	0.539** (15.93)	0.423** (10.89)	-0.425** (13.32)	-0.436** (12.88)	0.468** (13.38)	0.283** (9.17)
libertarianism	0.192** (5.71)	0.027 (0.67)	-0.031 (0.93)	0.027 (0.74)	-0.003 (0.10)	-0.051+ (1.74)
compassion	-0.344** (9.39)	-0.189** (4.53)	0.163** (4.87)	0.137** (3.74)	-0.199** (5.45)	-0.012 (0.40)
feminism	-0.343** (9.80)	-0.272** (6.46)	0.261** (7.58)	0.240** (6.37)	-0.255** (6.99)	-0.066* (2.16)
incomevalue10k	0.001* (2.20)	0.001+ (1.81)	-0.002** (3.08)	-0.000 (0.68)	0.001* (2.45)	-0.001 (1.19)
education1==1	0.360+ (1.81)	0.625** (2.65)	-0.942** (6.36)	-0.971** (4.66)	0.468* (2.28)	0.253 (1.61)
education1==2	0.375** (4.47)	0.366** (3.61)	-0.625** (7.42)	-0.648** (7.30)	0.309** (3.58)	0.283** (3.75)
education1==3	0.289** (3.54)	0.386** (3.78)	-0.431** (4.74)	-0.322** (3.42)	0.288** (3.19)	0.121 (1.57)
upmobile	0.099 (0.46)	0.012 (0.12)	-0.017 (0.20)	0.003 (0.03)	-0.029 (0.34)	0.035 (0.48)
downmobile	0.192 (1.27)	0.174 (0.69)	-0.094 (0.60)	0.207 (1.14)	0.186 (0.97)	-0.004 (0.03)
respondent age	0.000 (0.07)	-0.002 (0.31)	0.006 (1.28)	0.004 (0.69)	-0.009+ (1.77)	0.004 (0.95)
pre_crm_cohort	-0.195 (1.47)	-0.258 (1.55)	-0.416** (3.17)	-0.151 (1.02)	0.112 (0.79)	0.069 (0.57)
post_crm_cohort	-0.083 (0.76)	-0.243+ (1.69)	-0.003 (0.02)	0.027 (0.22)	-0.167 (1.36)	-0.080 (0.81)
femaledummy	-0.064 (0.96)	-0.034 (0.43)	0.000 (0.00)	-0.019 (0.27)	-0.053 (0.77)	-0.101+ (1.72)
marrieddummy	-0.059 (0.81)	-0.061 (0.73)	0.026 (0.37)	-0.043 (0.59)	0.026 (0.35)	0.016 (0.25)
unemployeddummy	0.011 (0.07)	0.146 (0.81)	-0.211 (1.35)	-0.185 (1.23)	-0.033 (0.21)	-0.169 (1.36)
unionmemdummy	0.058 (0.71)	0.022 (0.22)	0.019 (0.23)	-0.155+ (1.77)	0.041 (0.47)	-0.040 (0.55)
protestantism	-0.084 (0.10)	-0.040 (0.75)	-0.056 (1.27)	0.045 (1.00)	-0.066 (1.41)	-0.019 (0.48)
region==2 (Midwest)	0.118 (1.29)	-0.075 (0.66)	0.019 (0.20)	0.112 (1.18)	0.029 (0.30)	0.060 (0.73)
region==3 (South)	0.206* (2.09)	0.022 (0.18)	0.042 (0.43)	0.006 (0.06)	0.070 (0.68)	0.288** (3.23)
region==4 (West)	0.018 (0.18)	-0.256+ (2.23)	0.110 (1.07)	0.293** (2.80)	-0.013 (0.13)	0.097 (1.10)
Observations	1905	989	989	986	986	1697
Covered years	all	88,92	88,92	88,92	88,92	76,84,88,92
R-squared	0.25	0.20	0.30	0.28	0.26	

Robust t statistics for OLS and z statistics for OPROB (Ordered Probit) in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Year dummies and constant are controlled but not reported here

blacks lack an individualistic work ethic, a belief that is considered *race-neutral.* If this contention were true, we would expect that libertarianism, which is racism-free by construction, would have a highly significant coefficient; but it does not. This point is clearer in column (6). Racists are more likely to believe that the position of blacks has changed a lot, while racism-free libertarians, like feminists, say that it has not changed much. Thus Table 2-1 appears to show that it is not *racism-free libertarianism* but *racism camouflaged behind libertarian rhetoric* that explains much of the white opposition to various racial policies in the United States.

Our result is consistent with findings of other scholars. In measuring individualism or libertarianism, many scholars warn against treating positive answers to *race-referring* questions –such as "*blacks* can get better off if they try harder"– as a direct expression of individualism or libertarianism. Kinder and Sanders (1996) approach the issue by making use of a set of six questions in the NES that attempt to tap individualism in a race-neutral way (e.g., "*any person* who is willing to work hard has a good chance at succeeding"); it could be expected that those high on individualism measured in this way would be those most likely to oppose government action to help blacks. They find that controlling for social backgrounds, there is little evidence of a relationship between these two views.[15]

Table 2-1 also shows that the income variable is very weakly associated with racial views.[16] In most cases, the coefficients are not significant, and even in the significant cases the size of the coefficient is very small. One popular contention is that whites oppose racially liberal policies because whites are richer than minorities on average and these policies benefit only poor minorities at the cost of whites. But our results suggest that whites do not see racial policies as *redistributive* ones that are costly to them.

Next, we examined how important these four components are in explaining positions on various policy issues; see the regression results reported in Table 2-2. Other control variables in

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[15] Kinder and Mendelberg (2000) push this issue further and establish two important points. First, the racially-oriented individualism index, such as "blacks should try harder," is a potent component of opposition to racial policy while it has *no* effect on race-neutral policies focusing on general social class or gender. Second, in contrast, measures of race-neutral individualism *do not* influence attitudes on racial policy issues, although they *do* have effects on the role government and general (i.e., race-neutral) social policies. Thus they call the view "blacks should try harder" *racialized individualism.* In other words, this kind of measure mixes convictions about individual responsibility with resentment directed towards blacks. Schuman *et al.* (1997) point out that white acceptance of any role in having created black disadvantage appears to occur most clearly when responsibility is treated as shared by both races, rather than as focused entirely on whites themselves.

[16] We checked a possible non-linear effect of income by adding a quadratic term of the income variable. There is no evidence that income exercises a non-linear effect. We also checked whether entering the log of income improves the result. We found no difference. Indeed all the four components of political ideology are very weakly correlated with incomes. See Table A-2-3 in Appendix 1.

these regressions are exactly the same as those in Table 2-1, but to save the space, we report only the coefficients on the four core components. (Full regression results are reported in Appendix 1, Table A-2-4.)

Rows (l)-(6) report the results when the dependent variables are various measures of government spending. The dependent variable in row (1) is the question about general government spending. Both libertarians and racists are against increasing the spending, but the coefficient on libertarianism is not significant statistically.

Results derived from the question on *general* government spending might be misleading, because government spending consists of various components and people have varying opinions about different spending programs. The results in rows (2)-(6) support this claim. Indeed, libertarians and racists differ in several ways. Note that libertarians are strongly against increasing public school spending but the effect of racism is much weaker. Also libertarians want to increase environmental spending while racists want to decrease it. Indeed in the case of environmental spending, libertarianism is in line with feminism and compassion. Finally although libertarians strongly believe that the government wastes tax money, this belief is not strongly correlated with the racism variable (row (10)).

Thus it appears that racism-free libertarians are consistent in opposing any kind of government spending (except environmental), although coefficients are insignificant in many cases. Racists, on the other hand, exhibit different attitudes to different spending programs. It appears that racism negatively affects preference for government spending mainly when the spending program is perceived to target 'minorities' (such as welfare, food stamp, etc.).

Coefficients in the remaining rows are self-explanatory; we observe:

(1) The seven point 'government guaranteed job' scale in the NES (row (7)) is often regarded as a variable tapping the libertarian dimension of policy attitude. But our regression result indicates that it is a conflation of all four components. Furthermore, the most important characteristics in explaining the responses to this question are compassion and feminism rather than libertarianism.

Table 2-2: Influence of four factors on whites' attitude on various social issues (Source: NES)

	racism	liber-tarianism	compas-sion	feminism	Obs.	cov-ered years	R^2
(1) 7pt govt services/ spend-ing:1=decrease... 7=increase (OLS)	-0.205**	-0.061	0.234**	0.338**	1156	84,88 ,92	0.19
	4.22	1.56	5.16	7.5			
(2) 7pt govt health insur-ance: 1=pro...7=con (OLS)	0.226**	0.056	-0.326**	-0.376**	1541	76,84 ,88,9 2	0.17
	4.25	1.14	6.22	7.28			
(3) food stamps spending - federal budget: 1=increase ...3=decrease (OPROB)	0.196**	0.024	-0.375**	-0.235**	1193	84,88 ,92	
	5.33	0.71	10.16	6.56			
(4) public schools spending - fed budget:1=increase ...3=decrease (OPROB)	0.067+	0.106**	-0.083*	-0.264**	1225	84,88 ,92	
	1.74	2.92	2.2	7.07			
(5) social security-federal budget:1=increase...3=decreas e (OPROB)	-0.029	0.03	-0.111**	-0.126**	1216	84,88 ,92	
	0.76	0.85	3.01	3.41			
(6) environment spending-federal budget:1=increase... 3=decrease (OPROB)	0.157**	-0.061+	-0.056	-0.279**	1216	84,88 ,92	
	4.02	1.67	1.48	7.31			
(7) 7pt guaranteed job scale: 1=pro...7=con (OLS)	0.160**	0.200**	-0.310**	-0.318**	1863	all	0.16
	3.67	5.57	7.65	7.72			
(8) should worry less about equality: 1=agree...5=disagree (OLS)	-0.310**	-0.086*	0.200**	0.364**	1232	84,88 ,92	0.22
	7.64	2.29	5.23	9.59			
(9) poor-welfare-union thermometer: 0-100 (OLS)	-0.627**	-1.499**	13.183**	2.560**	2010	all	0.90
	4.97	13.9	104.77	17.55			
(10) does govt waste tax money: 1= a lot...3=not much (OPROB)	-0.029	-0.346**	0.068*	0.064*	2005	all	
	0.89	11.26	2.1	1.99			
(11) will people take advan-tage of someone: 0=no...1=yes (PROBIT)	0.273**	0.179**	0.015	-0.087	403	76	
	4.03	2.71	0.21	1.29			
(12) are people helpful: 0=no...1=yes (PROBIT)	-0.266**	-0.174**	0.016	0.079+	1000	76,92	
	5.81	3.86	0.35	1.72			
(13) 7pt defense spending: 1=decrease...7=increase (OLS)	0.325**	-0.031	-0.003	-0.223**	1473	80,84 ,88,9 2	0.26
	7.87	0.83	0.06	5.45			
(14) 7pt urban unrest: 1=solve by helping poor..7=solve by force (OLS)	0.447**	0.100+	-0.263**	-0.333**	916	76,92	0.20
	7.51	1.78	4.11	5.15			
(15) authority of bible: 1=agree...4=disagree (OLS)	-0.099**	0.032	-0.052*	0.075**	951	80,84 ,88	0.23
	4.65	1.6	2.52	3.6			
(16) should prayer be allowed in schools:1=agree... 3=disagree(OPROB)	-0.166**	-0.061	0.01	0.268**	543	80,84	
	2.43	1.1	0.18	4.44			
(17) when should abortion be allowed by law: 1=never...4=always (OLS)	-0.081**	0.018	-0.108**	0.277**	1511	80,84 ,88,9 2	0.29
	2.93	0.72	3.93	10.83			

Robust t statistics for OLS and z statistics for Probit and OPROBIT are reported in the second cell. Other regressors are exactly the same as those in Table 2-1.
+ significant at 10%; * significant at 5%; ** significant at 1%

(2) Racism appears to be positively correlated with authoritarian and traditionalist values, which true libertarians might oppose.[17] For instance, racism is positively correlated with support for defense spending (row (13)), while libertarianism is negatively correlated with it. Racists strongly prefer to solve the urban unrest problem by force, while libertarians' support for force is much weaker (row (14)). Libertarians are neutral about the authority of the bible, school prayer, and abortion, but racists are strongly in favor of school prayer, hold firm beliefs in the bible's authority, and take a strong anti-abortion position, even after controlling for a religion effect (rows (15)-(17)).

(3) Racism is also negatively correlated with variables tapping 'trust.' Racism is positively correlated with the view that 'people take advantage of someone' (row (11)) and negatively with the view that 'people are helpful' (row (12)). The finding that racism underlies both the perception that 'blacks are lazy' and the view that 'people take advantage of others' therefore suggests that more careful work is needed on reciprocal altruism, which postulates that "people feel altruistic toward others who are good to them and vengeful toward those who take advantage of them."

(4) Some authors, including Alesina *et al.* (2001), often find a positive effect of a religion variable, in particular Protestantism, on the 'blacks are lazy' variable, or variables capturing demand for redistribution, and interpret this as an indication of a protestant work ethic. Compared with other nations, Americans are certainly religious (in terms of religious preference, 64 percent of Americans are Protestant) and since the time of Max Weber, a protestant ethic has been an important explanatory variable for American exceptionalism.

This interpretation, however, appears to be too hasty. First, it implicitly assumes that a variable such as "blacks are lazy' is an indication of individualism. Second, it also assumes that members of a certain religious group, like Protestants, are more oriented towards the work ethic than those of other religious groups.

Regarding the first assumption, we have already shown that a variable such as 'blacks are lazy' is an indication of racial prejudice rather than individualism. Thus a proper interpretation of a result like regression (5) in Table 2-1 is that religiosity has nothing to do with prejudice, once ideological and demographic factors are controlled.

Regarding the second assumption, we emphasize that Protestants are a pluralistic group and on most issues there is greater disagreement among Protestants of various persuasions than between Protestants and other religious groups. In particular, mainline Protestants and more

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[17] A similar finding, that authoritarianism is strongly correlated with racism in some European countries, is

secular groups significantly differ from Evangelical Protestants and fundamentalist groups. Particularly important since the early-1980s are Evangelical groups, which now comprise 48% of all Protestants and about 22% of the population. Overall, these groups are very conservative, in particular on school prayer, civil rights, homosexuality, and women's issues, and have always been a mainstay of the Republican Party, except in 1976 when a 'born-again' Democratic candidate Jimmy Carter ran for election.

Figure 2-2 examines how religion is associated with different social attitudes.

If identification of protestantism with the 'work ethic' were correct, we would expect Protestants to be the most libertarian. What is clear from Figure 2-2 is that it is not Protestants (including both mainline and Evangelical Protestants) who are the most libertarian; rather it is non-traditional orthodox Christians, people with Non-Christian-non-Jewish religion, and people with-out religion. (On the other hand, both Jews and Catholics are anti-libertarian.) At the same time the figure shows that Evangelical Protestants are the most racist, the least compassionate, and the most anti-feminist; this attitude is sharply in contrast with mainline Protestants.[19] The same pattern is confirmed from multivariate regressions of the four ideological components on demographic factors (Table A-2-3 in Appendix 1).

Thus the positive coefficient of the Protestantism variable reported in some empirical analyses, in particular when these regressions do not control for ideological components, may be just a reflection of ideological components, such as racial conservatism or authoritarianism. Our results show that once ideological components are controlled for, religiosity is correlated with only religious issues, such as school prayer and abortion issues, and has nothing to do with either individualism/libertarianism or racial prejudice.

Finally, we examine the importance of these factors in shaping party preferences; see Table 2-3.

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reported by Pettigrew (2000).

[18] In 1980, for instance, the 'born-again' white Christians gave Reagan 61% of their vote. Comparatively speaking, they tend to be rural, Southern, and less educated than\he rest of the population.

[19] We also note that the level of trust is much lower in Evangelical groups than among average white Americans.

Figure 2-2: Religion and political ideology: Whites only (1976-1992) (Source: NES)

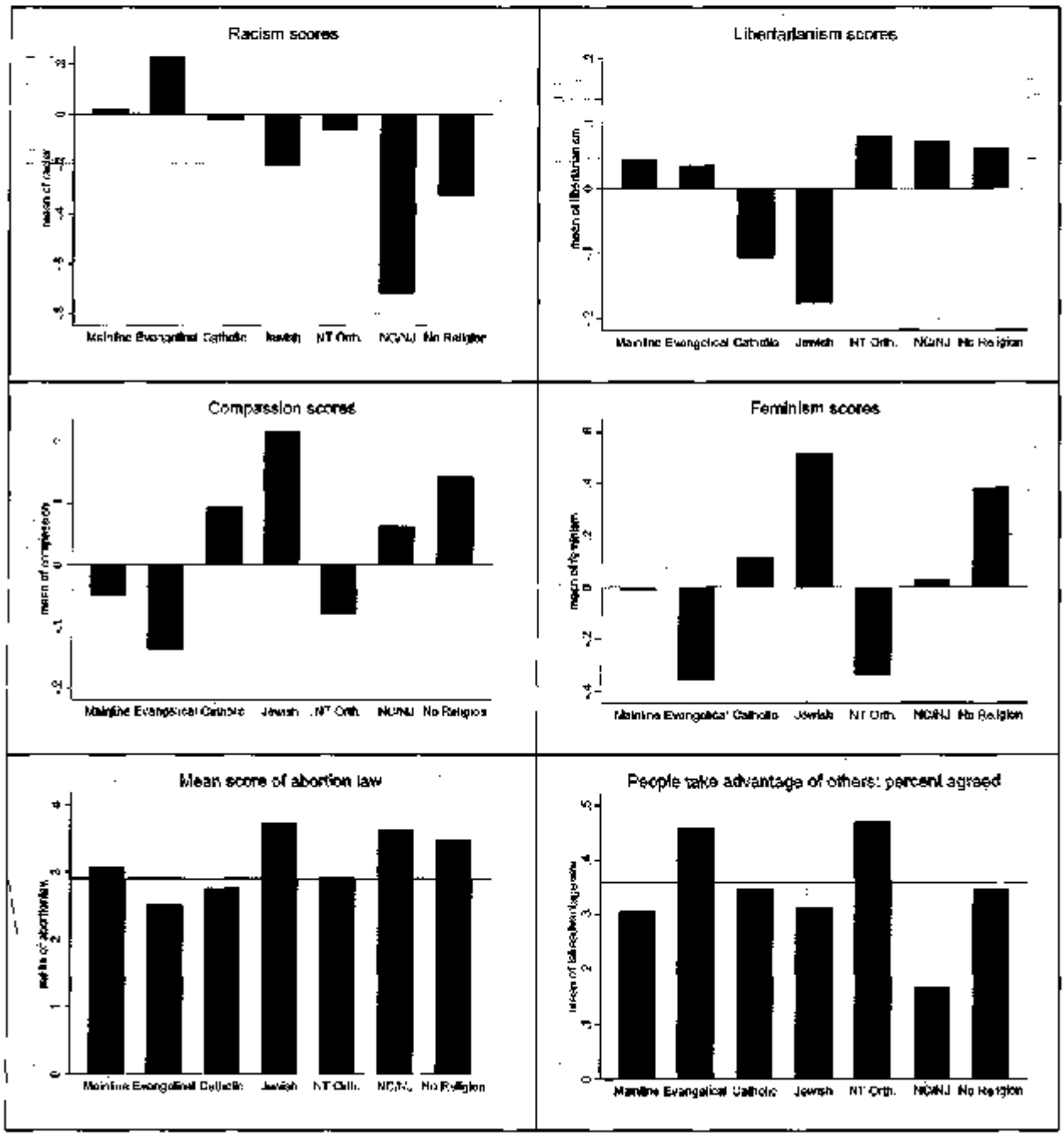

Table 2-3: Determinants of whites' attitude on political parties (Source: NES)

	(1) OLS	(2) OLS	(3) PROB	(4) PROB	(5) PROB
	democratic party affect	republican party affect	defectionD	defectionR	presvoteR
racism	-0.214**	0.298**	0.256**	-0.122+	0.311**
	(4.86)	(6.82)	(3.34)	(1.69)	(6.90)
libertarianism	-0.060	-0.047	-0.003	-0.069	0.023
	(1.43)	(1.14)	(0.04)	(1.10)	(0.56)
compassion	0.216**	-0.156**	-0.192*	0.069	-0.240**
	(4.95)	(3.60)	(2.54)	(0.98)	(5.52)
feminism	0.513**	-0.541**	-0.303**	0.206**	-0.415**
	(11.79)	(12.52)	(4.11)	(2.61)	(9.17)
incomsvalue10k	-0.001	0.002*	0.003+	-0.001	0.002**
	(1.64)	(2.04)	(1.94)	(0.55)	(3.05)
education1==1	0.744**	0.166	-0.029	0.016	-0.258
	(3.12)	(0.71)	(0.08)	(0.03)	(1.05)
education1==2	0.067	0.033	0.089	0.294+	-0.045
	(0.62)	(0.31)	(0.48)	(1.74)	(0.42)
education1==3	-0.203+	0.249*	0.233	0.122	0.133
	(1.82)	(2.25)	(1.26)	(0.74)	(1.26)
upmobile	-0.208+	0.365**	0.519**	0.095	0.189+
	(1.94)	(3.41)	(2.84)	(0.59)	(1.75)
downmobile	-0.406*	0.091	0.057	0.342	0.294
	(2.13)	(0.48)	(0.16)	(1.26)	(1.56)
pastecon-omy*incumbentisD	-0.230*		0.096		
	(2.25)		(0.88)		
pastecon-omy*incumbentisR		-0.225**		0.199**	-0.244**
		(6.30)		(3.40)	(6.79)
femaledummy	0.191*	0.059	0.243+	-0.006	0.115
	(2.25)	(0.70)	(1.75)	(0.04)	(1.38)
marrieddummy	-0.147	0.094	-0.003	-0.137	0.109
	(1.63)	(1.05)	(0.02)	(0.94)	(1.23)
unemployeddummy	-0.312+	-0.006	-1.033+	0.201	-0.285
	(1.69)	(0.03)	(1.85)	(0.59)	(1.29)
unionmemdummy	0.180+	-0.337**	-0.300+	-0.118	-0.276**
	(1.66)	(3.14)	(1.80)	(0.64)	(2.67)
protestantism	-0.109+	0.153**	-0.037	-0.227**	0.203**
	(1.94)	(2.74)	(0.39)	(2.66)	(3.78)
respondent age	0.000	-0.015*	-0.018+	-0.004	-0.005
	(0.01)	(2.43)	(1.78)	(0.41)	(0.76)
pre_crm_cohort	-0.008	0.289+	0.227	-0.025	0.053
	(0.04)	(1.65)	(0.83)	(0.09)	(0.32)
post_crm_cohort	-0.067	-0.145	-0.362	-0.005	-0.168
	(0.46)	(1.00)	(1.56)	(0.02)	(1.19)
region==2 (Midwest)	-0.055	-0.037	-0.285	0.160	0.074
	(0.45)	(0.30)	(1.43)	(0.80)	(0.62)
region==3 (South)	-0.002	-0.011	-0.052	-0.195	0.127
	(0.49)	(0.09)	(0.26)	(0.89)	(1.01)
region==4 (West)	0.135	-0.096	-0.096	0.113	-0.031
	(1.07)	(0.76)	(0.50)	(0.55)	(0.25)
Observations	1527	1527	537	595	1234
Covered years	80,84,88,92	80,84,88,92	80,84,88,92	80,84,88,92	80,84,88,92
R-squared	0.17	0.22			

Robust t statistics for OLS and z statistics for Probit in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Year dummies and constant are controlled but not reported here.

Columns (1) and (2) report the determinants of party affect, and they clearly show that racism, together with compassion and feminism, is an important factor in determining a voter's party affect. Clearly libertarians do not like the Democratic Party, but the effect of racism is stronger than that of libertarianism; also libertarianism is not significant as a determinant of the Republican party affect, once racism has been controlled for.

At the beginning of this section, we documented that the large-scale white flight from the Democratic Party in the past three decades. For most people, party identification is a central aspect of political identity. Compared to ordinary political opinions, a person's party identification is quite stable over time, both before and after adjustment for measurement error. What drove such a large-scale white flight?

To estimate the effects of different types of issues on white flight from the Democratic Party, we conducted probit analyses of voting behavior separately for those who declare that they are Democrats and for those who declare that they are Republicans. The dependent variable in this analysis is party defection: among the self-declared Democrats, those who vote D are coded 0; those who had defected from the Democratic Party (i.e., those who voted for either R or a third candidate) are coded 1. Similarly, among the self-declared Republicans, those who voted R are coded 0; those who defected are coded 1.

Columns (3) and (4) in Table 2-3 show that the defection of Democrats was largely due to their dissatisfaction with the Democratic Party's racial liberalism, whereas the defection of Republicans was mainly due to their dissatisfaction with the Republican party's conservatism on the gender/family issue. Poor economic performance under a party's incumbency is also an important factor explaining the defection from that party. In contrast to Abramowitz's (1994) argument that the large-scale defection of whites from the Democratic Party is mainly due to traditional Democrats' becoming increasingly fed up with big government and the welfare state, the libertarianism variable is statistically insignificant and carries a negative coefficient.[20]

Column (5) shows the result of our probit regression on voting pattern. Because there are only two parties, we report only the R vote share. Again racism, compassion, and feminism show up as important explanatory variables, but libertarianism does not. Figure 2-3 shows the slope of the regression equation with respect to each component of political ideology, together with 95% asymptotic confidence intervals; the graph is almost flat with respect to libertarianism.

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[20] We point out that Abramowitz's racism variables mainly measure Jim Crow racism.

We have seen the importance of voter racism in various ways; what matters for our purposes is the voter's position on politically salient racial issues, such as affirmative action or the government's aid to minorities. One variable that measures the voter position on racial issues is the '7 point aid-to-blacks score.' Complications of interpretation arise, however, because the voter position on aid-to-blacks could be shaped by many factors, not just by racism. For instance, as we have seen in Table 2-1, libertarianism plays some role in explaining this variable, although a much larger effect is due to racism. Simply treating voters who are not in favor of aid-to-blacks as racist would overestimate the extent of racial conservatism in the US; we need to extract from the 'aid-to-blacks' questions the effect of other factors which may have nothing to do with racism.

We therefore construct the *aid-to-blacks score induced only by voter racism* as follows. The aid-to-blacks variable runs from 1 to 7, but let us assume that voters' true attitudinal value on aid-to-blacks lies continuously in the interval [0.5,7.5].[21] For the samples consisting of white respondents, we ran the following regression in each year,

$$Aidtoblacks = \frac{7 * \exp(\alpha_1 Racism + \alpha_2 \mathbf{Z} + \nu)}{1 + \exp(\alpha_1 Racism + \alpha_2 \mathbf{Z} + \nu)} + 0.5, \qquad (1)$$

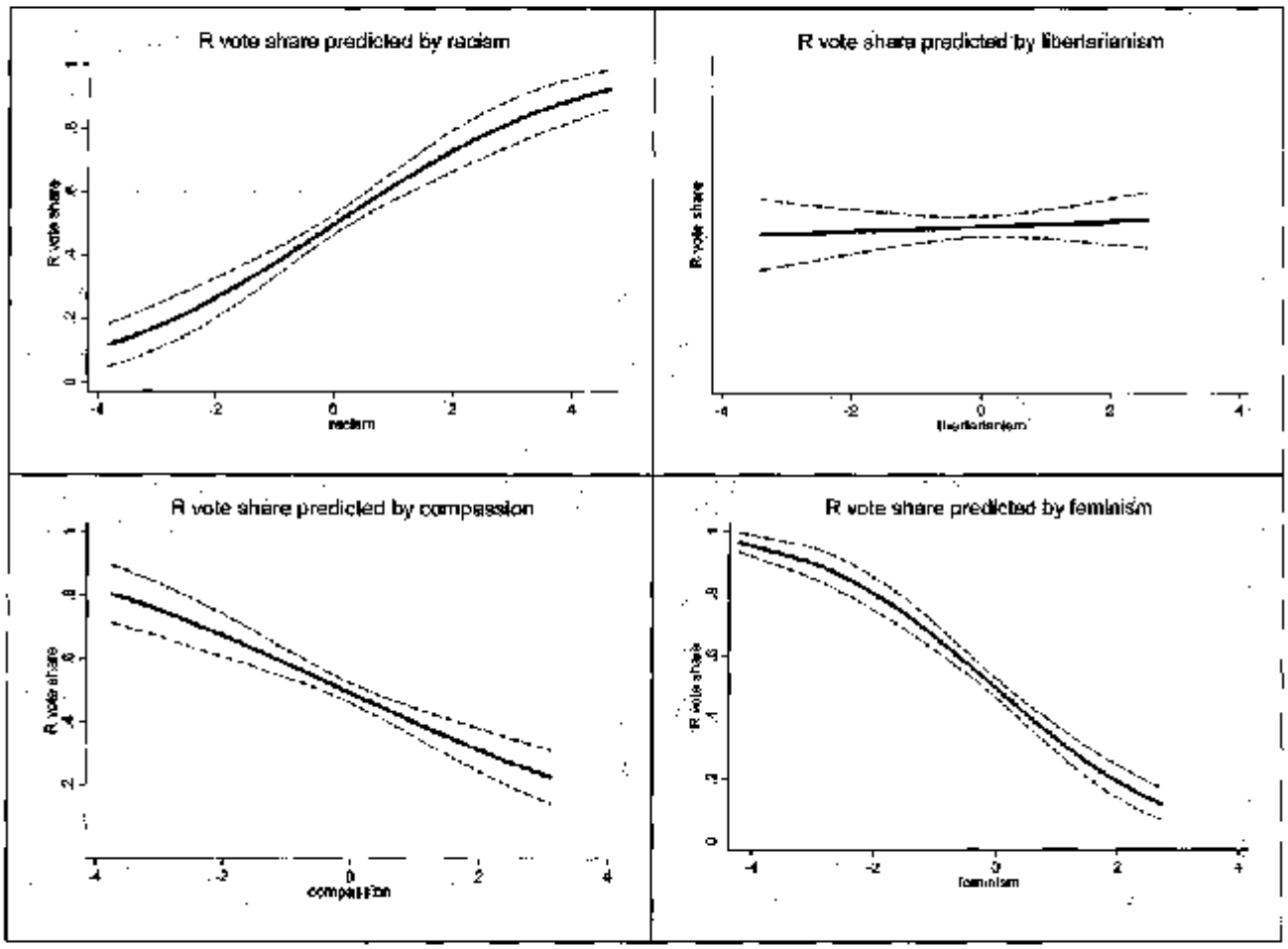
which is equivalent to

$$\log\left(\frac{Aidtoblacks - 0.5}{7.5 - Aidtoblacks}\right) = \alpha_1 Racism + \alpha_2 \mathbf{Z} + \nu, \qquad (2)$$

where $\mathbf{Z}$ is the vector of all other variables in the regression (those appearing in Table 2-2) and ν is the error term. Then 'racism-induced aid-to-blacks' is constructed from the above regression by the equation, $\rho = \frac{7 * \exp(\hat{\alpha}_1 Racism + \hat{\alpha}_2 \overline{\mathbf{Z}})}{1 + \exp(\hat{\alpha}_1 Racism + \hat{\alpha}_2 \overline{\mathbf{Z}})} + 0.5$, where $\overline{\mathbf{Z}}$ is the mean value of the vector $\mathbf{Z}$. This procedure generates a policy position variable whose variation is explained only by the variation of racism after controlling for other explanatory variables. It also guarantees that our racism-induced aid-to-blacks scores have the same support as the original aid-to-blacks scores.

[21] One may argue that ordered probit regressions may allow one to estimate the cutoff points as well as regression coefficients for categorical dependent variables, but it is well known that estimates obtained from the maximum likelihood estimation method are not robust if the error term is not normally distributed. This problem is serious for the estimates of the cutoff points. We do not attempt to estimates these cutoff points. We used the OLS estimation method, which is more robust to possible misspecifications, after taking the logistic transformation of the dependent variable.

Figure 2-3: Changes in the predicted R vote share with respect to changes in 4 core ideologies based on a probit regression of Table 2-3



Note: (1) Graphs are based on the estimated coefficients reported in column (5) of Table 2-4. We fixed all other variables at their mean values.
(2) Thin dotted lines around the thick solid lines are upper and lower bounds of 95% asymptotic confidence intervals. The asymptotic standard errors of the predicted *R* vote shares are computed using a delta method (see Greene (2000), p. 824).

The racism-induced aid-to-blacks is our measure of voters' racial policy position. For blacks we assign the score of 1.[22]

The NES provides information on the public perception of the presidential candidates' positions on aid-to-blacks. Figure 2-4 graphically illustrates the mean score of voters' racism-induced aid-to-blacks together with the candidate positions perceived by the public.

As is clear from Figure 2-4, the racial positions of the two parties' candidates have always been somewhat different, at least in the eyes of the public. If citizens are perceptive, this picture clearly challenges the convergence thesis of Downsian models.

3. The Equilibrium Model

In this section we present a model of political competition between two parties where the policy space is *two-dimensional;* one dimension of competition concerns redistribution, and the other, racial policy. Parties will propose, in their platforms, both a fiscal policy and a policy on the race issue.

Our discussion in section 2 establishes the following two claims. First, racism is an important element in American electoral politics. Thus any political economy model not taking into account of this dimension misses a key aspect of American politics. We require a model of multidimensional political competition, which is more sophisticated than the Downsian model. Second, as Figure 2-4 clearly shows, candidate positions are differentiated, which means that we require a model that has *differentiated party platforms* at the equilibrium.

The model of multi-dimensional political competition is that of Roemer (2001), called *party unanimity Nash equilibrium with endogenous parties* (PUNEEP). Our exposition will be minimal; the reader is referred to Roemer (2001) for more detail.

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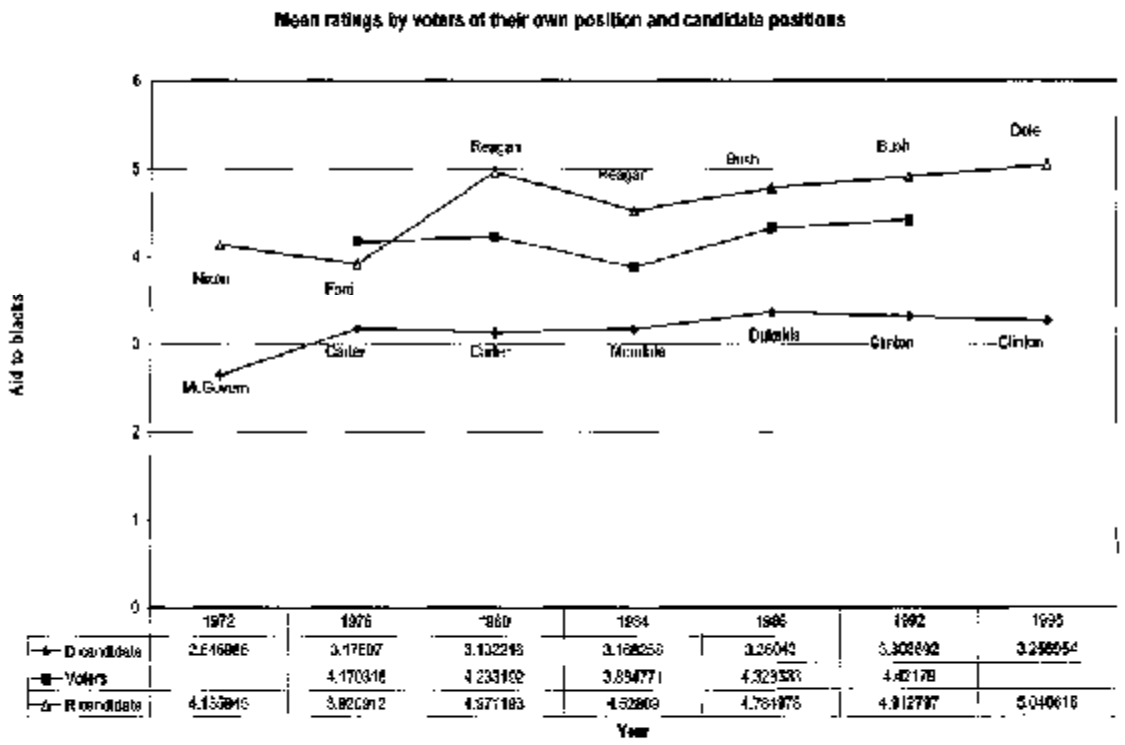
[22] When we estimate the distribution of voter types, however, we avoid the problem of censoring by assuming that blacks are distributed on the support of [0.5, 1.5] according to a normal distribution with mean 1 and a small variance. See section 4. In econometric estimation, censoring is not a problem as long as the racism variable appears as an explanatory variable or when the regressions are undertaken for whites and blacks separately. Also no whites have the racism-induced aid-to-blacks score less than 1.5.

Figure 2-4: Mean ratings of position on the racial issue: Voter's racism-induced position and candidate positions (Source: NES)



Note: (1) Voters' racial policy position is computed by the mean score of racism-induced aid-to-blacks.
(2) Candidate positions are computed by the mean scores of aid-to-blacks of candidates perceived by voters.

A. Definition and equilibrium

The model takes as *data* the distribution of voter preferences over an issue space, and produces as *output*: (1) a partition of the polity into two parties, (2) two policy vectors (or platforms) that parties propose in competitive political equilibrium, and (3) the expected vote share that each party receives in the election. Formally, we take as data a set of voter types $H \subset \mathbf{R}^n$, a probability measure P on H, a policy space $T \subset \mathbf{R}^m$, and a profile of voter utility functions on T, where $v(.;\eta)$ is the utility function of a voter type $\eta \in H$ on T.

The theory produces, given $\{\mathbf{P}, H, v, T\}$, a two-dimensional manifold of equilibria, which we will denote $\{\Gamma^D(i), \Gamma^R(i), \tau^D(i), \tau^R(i)\}$. Each i indexes one equilibrium; in the i^{th} equilibrium, $\Gamma^D(i)$ is the set of voter types who belong to and vote for the Democratic party, $\Gamma^R(i)$ is the set of voter types who belong to and vote for the Republican party, $\tau^D(i) \in T$ is the platform of the Democratic party in this equilibrium, and $\tau^R(i) \in T$ is the platform of the Republican party in the equilibrium.

We proceed to define the equilibrium concept. It is presumed that there are two political parties, and that each party's decision makers comprise three factions: Opportunists, Reformists, and Militants.

Suppose that the constituents of party D are denoted by the set of types $\Gamma^D \subset H$, and the constituents of party R are denoted by the set of types $\Gamma^R = H \setminus \Gamma^D$. Define

$$V^D(\tau) = \int_{\Gamma^D} q^D(\eta) v(\tau;\eta) d\mathbf{P}(\eta), \tag{3}$$

and

$$V^R(\tau) = \int_{\Gamma^R} q^R(\eta) v(\tau;\eta) d\mathbf{P}(\eta), \tag{4}$$

where $q^J(\eta)$ is a weight function given to members of party J for J=D,R. Hence V^J is the weighted average utility function of party J's constituents. In the ideal case of perfectly representative democracy, the weights would be equal for all η in both parties. In reality, however, party platforms are greatly influenced by, say, campaign contributions. Bartels (2002) examines the differential responsiveness of U.S. senators to the preferences of rich and poor constituents, including broad summary measures of senators' roll call voting behavior, as well as specific votes on the minimum wage, civil rights, government spending, and abortion. In every instance, he finds that on average, constituents at the 75th percentile of the income distribution have almost three

times as much influence on senators' general voting patterns as those at the 25th percentile, and several times as much influence on specific salient roll call votes. The weight function is introduced as a short-cut to capture the unequal influence of constituents on party policy.

In an election between two policy platforms, $\tau^D, \tau^R \in T$, denote the *probability* that τ^D defeats τ^R by $\pi(\tau^D, \tau^R)$, on which more below. The three factions in each party have different interests, which induce their different *payoff functions*. The Opportunists in a party wish to choose a policy that will maximize their party's probability of victory. The Reformists wish to choose a policy that will maximize the expected utility of the party, using the utility function V^J ($J = D$ or R). The Militants are unconcerned about immediate victory; they wish to announce a policy as close as possible to the (weighted) ideal policy of their constituents (members). Thus the three payoff functions of these factions in the D party, on $T \times T$, are given by:

$$\Pi^{D-Opp}(\tau^D, \tau^R) = \pi(\tau^D, \tau^R), \tag{5}$$

$$\Pi^{D-Ref}(\tau^D, \tau^R) = \pi(\tau^D, \tau^R)V^D(\tau^D) + (1 - \pi(\tau^D, \tau^R))V^D(\tau^R), \tag{6}$$

$$\Pi^{D-Mil}(\tau^D, \tau^R) = V^D(\tau^D), \tag{7}$$

In like manner, we define Π^{R-Opp}, Π^{R-Ref}, and Π^{R-Mil}.

Definition: A *party unanimity Nash equilibrium with endogenous parties (PUNEEP)* is a partition $H = \Gamma^D \cup \Gamma^R$, $\Gamma^D \cap \Gamma^R = \phi$, and a pair of policies $(\tau^D, \tau^R) \in T \times T$ such that:

(1) there is no $\tau \in T$ such that $\Pi^{D-f}(\tau, \tau^R) \geq \Pi^{D-f}(\tau^D, \tau^R)$, for f = Opp, Ref, Mil, with at least one strict inequality;

(2) there is no $\tau \in T$ such that $\Pi^{R-f}(\tau^D, \tau) \geq \Pi^{R-f}(\tau^D, \tau^R)$, for f = Opp, Ref, Mil, with at least one strict inequality; and

(3) given (τ^D, τ^R),

$$\eta \in \Gamma^D \Rightarrow v(\tau^D; \eta) \geq v(\tau^R; \eta),$$

$$\eta \in \Gamma^R \Rightarrow v(\tau^R; \eta) \geq v(\tau^D; \eta).$$

Remark 1: Condition (1) can be viewed as modeling the idea that, facing the policy τ^R proposed by party R, the three factions in party D have bargained internally to a proposal τ^D, because τ^D lies on the Pareto mini-frontier of D's three factions' payoff functions, given τ^R. In like

manner, condition (2) models the idea that τ^R is a bargaining outcome among Right's three factions, facing τ^D. So a PUNEEP incorporates competition between parties (in the sense of Nash equilibrium) and bargaining among internal factions. (Indeed, it can be shown (Roemer, 2001, Chapter 8) that with further restrictions, we can characterize the internal conflict as *Nash bargaining*.) A formula for the inner party bargaining power of factions will be presented in section 3.E. We do not specify the relative bargaining strengths of factions *a priori*, because, first, we do not know the empirical bargaining power of the factions, and second, we cannot be sure that equilibrium will exist, with respect to any given *pre-specified* pair of relative bargaining strengths. Condition (3) is a condition of membership stability; it says that no party member prefers the opposition party's policy at the equilibrium.

Remark 2: It is easy to show that the Reformists are gratuitous: that is, we can excise them from the construction, and the set of equilibria does not change (Roemer, 2001, Chapter 8). We use this remark in the following characterization of PUNEEP.

We proceed to a local characterization of PUNEEPs that are in the interior of $T \times T$. Suppose $T \subset \mathbf{R}^m$. Define $\nabla_J \pi(\tau^D, \tau^R) = (\frac{\partial \pi}{\partial \tau_1^J}, ..., \frac{\partial \pi}{\partial \tau_m^J})$, $\nabla V^J(\tau) = (\frac{\partial V^J}{\partial \tau_1}, ..., \frac{\partial V^J}{\partial \tau_m})$, and $\Omega(\tau^D, \tau^R) = \{\eta \in H \mid v(\tau^D; \eta) \geq v(\tau^R; \eta)\}$. Then a PUNEEP is a partition $\Gamma^D \cup \Gamma^R$ of H and a policy pair $(\tau^D, \tau^R) \in T \times T$ such that for some $x^D, x^R \in \mathbf{R}_+$,

$$-\nabla_D \pi(\tau^D, \tau^R) = x^D \nabla V^D(\tau^D), \tag{8}$$

$$\nabla_R \pi(\tau^D, \tau^R) = x^R \nabla V^R(\tau^R), \tag{9}$$

$$\Gamma^D = \Omega(\tau^D, \tau^R), \ \Gamma^R = H \setminus \Gamma^D. \tag{10}$$

Equation (8) says that, given τ^R, there is no direction in T at τ^D which will increase the payoffs of both Opportunists and Militants of party D, and equation (9) implies the analogous statement for party R's Opportunists and Militants. These two equations say that the indifference curves of the Opportunists and the Militants in party J are tangent at the equilibrium. Equation (10) says that party D's constituents are exactly those voters who weakly prefer policy τ^D. By Remark 2, these are the necessary conditions that characterize a PUNEEP.

Note that equations (8) and (9) comprise 2m equations in 2m+2 unknowns: $(\tau^D, \tau^R, x^D, x^R) \in \mathbf{R}^{2m+2}$. Consequently, if there are any solutions, we can expect a 2-manifold of them.[23]

We proceed to discuss our application of the model to the present paper.

B. Preferences, type space, and policy space

We postulate that the economic position of an individual h is given by his/her family head's real wage rate, denoted by $\hat{w}_h$ and called the *representative wage* of individual h. The representative wage of individual h is an individual wage except for wives. We note that most of family heads for married couples are males, and even when the head is a female, the male member earns higher income than the female member in most cases. Thus $\hat{w}_h$ coincides with his/her own wage for singles and married males but corresponds to the husband's wage for a married female. The racial position of voter h is, on the other hand, completely individualistic; we denote it by ρ_h; a wife's racial position is allowed to differ from her husband's. We measure the racial position of voters by the 'racism-induced aid-to-blacks' that we constructed in section 2.

The *type* of voter h is thus characterized by a pair $\eta = (\hat{w}_h, \rho_h) \in H$ and the type space is two-dimensional. (Do not confuse h with η. Letter h is an index for individuals while η is a voter type.) The distribution of voter types is given by a joint density function $g(\rho \mid \hat{w}) f(\hat{w})$. The distribution function for $f(.)$ is $F(.)$ and the distribution function for $g(. \mid \hat{w})$ is $G(. \mid \hat{w})$.

The justification for our model specification—i.e., that a voter's economic position is characterized by his/her representative wage while his/her racial position is individualistic – is threefold. First, many tax-benefit policies in the US are applied at the family level. Consumption and labor participation behavior of an individual can be properly understood only within the family framework. Second, labor supply behavior may be different between males and females, in particular for married couples. Third, voting behavior on the tax rate will typically depend on family income, not individual income, but voting behavior on the racial issue can be quite different among the members of the same family (although there may be a strong correlation among family members). For instance, although her actual earned income is zero, a non-working housewife liv-

[23] The price we pay for *existence of political equilibrium on the multi-dimensional policy space is therefore indeterminacy*. (For further discussion, see the aforementioned Roemer citation.) The dimensionality of the solution

ing with a rich husband may vote like a rich individual on tax rates. She may, however, be more liberal than her husband on the racial issue. Our utility function will permit this possibility.

We postulate that a voter has direct preferences over vectors (x_h, L_h^f, E, r), where x_h is the consumption of goods and services of voter h *at the family level*, L_h^f is the vector of working hours of the voter's family members (hence $L_h^f = L_h$ if h is single, and $L_h^f = (L_{M(h)}, L_{F(h)})$ if he/she is married, where $M(h)$ ($F(h)$) stands for the male (female) member of h's family), E is a measure of equality in the distribution of family consumption, and r is the position of the elected government on racial issues.

More specifically, the direct utility function of an individual h is of the form:

$$U(x_h, L_h^f, E, r; \hat{w}_h, \rho_h) = \phi(x_h, L_h^f) - \frac{\gamma}{2}(r - \rho_h)^2 + (\delta_0 - \delta_2 \rho_h)E, \qquad (11)$$

where $\phi(x_h, L_h^f) = \begin{cases} Log(x_h) + \beta_M Log(\lambda_M - L_{M(h)}) + \beta_F Log(\lambda_F - L_{F(h)}) & \text{if } h \text{ is married} \\ Log(x_h) + \beta_S Log(\lambda_S - L_h) & \text{if } h \text{ is single} \end{cases}$

and $E = Log\left(\frac{x_{0.25}}{x_{0.75}}\right)$ is the log ratio of the consumption of the family at the 25th percentile of the income distribution to that at the 75th percentile.

This utility function consists of three parts: the sub-utility function $\phi(.)$ defined over consumption and labor participation of family members, the preferences over the race issue, and preferences for equality.

It is assumed that the β's and λ's, which affect the shape of labor supply functions, differ across sexes and marital statuses, but do not differ among individuals in each subgroup.

Voters' preferences with regard to the race issue are Euclidean, where the parameter γ measures the *relative salience* of the race issue. The coefficient of the equality term E measures the extent to which voters value equality in the distribution of consumption.

Note that the coefficient of E is negatively related to voter's degree of racism (ρ_h), assuming that $\delta_2 > 0$. Larger ρ means a more racist voter, and so the anti-solidarity effect of racism is embodied in the parameter δ_2 (the more positive the coefficient δ_2, the stronger the anti-solidarity effect). The policy bundle effect, on the other hand, will depend on the parameter γ.

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manifold is related to the number of factions, not the dimension of the policy space.

Each political party will propose an affine tax policy (t,b), applied to family income, and a racial policy, r. The policy vector is applied to all individuals, once determined through political competition.

Let Y be the earned family income and O other non-wage income (usually consisting of asset income, minus deductions and exemptions). Then if the tax rate is t and the lump-sum payment is b, post-fisc income (which we call 'consumption') will be

$$x_h = (1-t)(Y_h + O_h) + b. \tag{12}$$

If each individual of the household chooses his/her labor supply by optimizing against the tax policy and the market wage rate, (i.e., $L_h^f = L^f(\hat{w}_h, t, b)$), then the earned family income will be a function of the wage rate and the fiscal policy: $Y_h = Y(\hat{w}_h, t, b)$. On the other hand, O is not a choice of the household in the present period: we view it as being determined by past decisions. We will approximate the non-wage income as a function of earned incomes (see below).

C. Labor supply decision of household members

We first describe the labor supply decision of married couples. To avoid cluttering the notation, we will drop h henceforth.

The optimality conditions for labor supply are

$$\frac{(1-t)w_s}{x} = \frac{\beta_s}{\lambda_s - L_s}, \tag{13}$$

where $s = M, F$, and $x = (1-t)(w_M L_M + w_F L_F + O) + b$. (Notational remark: We use the capital letter S to denote 'singles,' and the small letter s as an index for 'sexes.') Rearranging terms for both sexes, we have the following two equations:

$$L_M = \frac{\lambda_M}{1+\beta_M} - \frac{\beta_M}{1+\beta_M}\left(\frac{b}{(1-t)} + w_F L_F + O\right)\frac{1}{w_M} \text{ for males,} \tag{14}$$

and

$$L_F = \frac{\lambda_F}{1+\beta_F} - \frac{\beta_F}{1+\beta_F}\left(\frac{b}{(1-t)} + w_M L_M + O\right)\frac{1}{w_F} \text{ for females.} \tag{15}$$

Note that for an individual of either sex, the labor supply function is negatively correlated with taxes, transfers, and the labor income of his/her spouse, and positively correlated with his/her own wage.

To maintain the two dimensional type space, we assume that female wage rates are proportional to male wage rates: $w_F = k_t w_M$ for married couples. Empirically, the female wage rate is represented quite accurately as a proportion of the male wage rate. For a nonworking housewife, w_F is her imputed wage rate, which is positive if her husband is working.[24]

Solving equations (14) and (15) simultaneously and using the facts that $w_F = k_t w_M$ and $\hat{w} = w_M$ for married couples, we compute the optimal labor supply for both sexes:

$$\hat{L}_M(t,b,\hat{w}) = \frac{\lambda_M(1+\beta_F) - k_t\lambda_F\beta_M}{1+\beta_M+\beta_F} - \frac{\beta_M}{1+\beta_M+\beta_F}\left(\frac{b}{(1-t)} + O\right)\frac{1}{\hat{w}}, \tag{16}$$

and

$$\hat{L}_F(t,b,\hat{w}) = \frac{\lambda_F(1+\beta_M) - \beta_F\lambda_M\frac{1}{k_t}}{1+\beta_M+\beta_F} - \frac{\beta_F}{1+\beta_M+\beta_F}\left(\frac{b}{(1-t)} + O\right)\frac{1}{k_t\hat{w}}. \tag{17}$$

We derived the labor supply functions for married couples. For singles, we do not have to consider the simultaneous decision problem. Hence for singles

$$\hat{L}_S(t,b,\hat{w}) = \frac{\lambda_S}{1+\beta_S} - \frac{\beta_S}{1+\beta_S}\left(\frac{b}{1-t} + O\right)\frac{1}{\hat{w}}, \tag{18}$$

where $\hat{w}$ is his/her own wage.

Using (16) and (17) and (18), we obtain household labor income of an individual:

$$Y = \begin{cases} w_M\hat{L}_M(t,b,\hat{w}) + k_t w_M\hat{L}_F(t,b,\hat{w}) & \text{for a married} \\ w_S\hat{L}_S(t,b,\hat{w}) & \text{for a single} \end{cases} = A^*\hat{w} - B^*\left(\frac{b}{1-t} + O\right), \tag{19}$$

where $A^* = \begin{cases} \dfrac{\lambda_M + k_t\lambda_F}{1+\beta_M+\beta_F} & \text{for a married} \\ \dfrac{\lambda_S}{1+\beta_S} & \text{for a single} \end{cases}$ and $B^* = \begin{cases} \dfrac{\beta_M+\beta_F}{1+\beta_M+\beta_F} & \text{for a married} \\ \dfrac{\beta_S}{1+\beta_S} & \text{for a single} \end{cases}$.

Hence pre-tax family income, as the sum of labor income and other non-labor income, is given by

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[24] There is a housewife whose actual *labor income* is zero while her husband's labor income is quite large. This is not inconsistent with our assumption that a wife's imputed *wage rate* is proportional to her husband's wage rate (and therefore positive) because the wife may rationally opt for not participating in the labor market. As we will see below, a wife may provide no labor supply if her husband's labor income is sufficiently high.

$$W = A^*\hat{w} - B^*(\frac{b}{1-t} + O) + O = A^*\hat{w} - B^*\frac{b}{1-t} + (1-B^*)O. \qquad (20)$$

'Other non-wage income' is usually generated from savings, the source of which is past labor income or past other income (i.e., the past pre-fisc income). We assume that 'other income' is proportional to the current pre-fisc income: $O = k_3 W$ (see section 4). Past pre-fisc income is highly correlated with current pre-fisc earned income. Then pre-fisc family income is

$$W = \frac{1}{1-k_3(1-B^*)}(A^*\hat{w} - B^*\frac{b}{1-t}). \qquad (21)$$

Equation (21) simply states that the pre-fisc income W is proportional to labor income, where the proportion coefficient is greater than 1, due to the existence of other non-wage income.[25]

As we said, taxes are imposed on pre-fisc family income, so that consumption is

$$x(t,b,\hat{w}) = (1-t)W + b = \frac{(1-t)A^*\hat{w} + (1-k_3)(1-B^*)b}{1-k_3(1-B^*)}. \qquad (22)$$

Thus dropping constant terms we have

$$\phi(x(t,b,\hat{w}), L^f(t,b,\hat{w})) = \begin{cases} Log((1-t)A^*\hat{w} + (1-k_3)(1-B^*)b)^{1+\beta_M+\beta_F} - Log((1-t)\hat{w})^{\beta_M+\beta_F} & \text{for a married} \\ Log((1-t)A^*\hat{w} + (1-k_3)(1-B^*)b)^{1+\beta_S} - Log((1-t)\hat{w})^{\beta_S} & \text{for a single} \end{cases} \qquad (23)$$

In principle, one could estimate $\beta's$ and $\lambda's$ for married couples and singles separately, but this would require a tremendous amount of computation time.[26] To reduce our computation time we will estimate them for married couples only and then simply impute $\beta_S = \beta_M + \beta_F$ and $\lambda_S = \lambda_M + k_1\lambda_F$ for singles. In other words, it is assumed that the indirect subutility functions are identical for both married couples and singles.[27]

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[25] Since O is the asset income accumulated from the past labor income, not *current* labor income, voters take O as given when they choose labor supply, and so we did not use the relationship between O and W when we derived the labor supply functions.

[26] Our computations involve many of highly time-consuming numerical integrations. If the utility functions are allowed to differ between married couples and singles, we have to integrate separately for married couples and singles.

[27] Our approach is justified if an allocation of *individual* time between work and leisure for singles is similar to the allocation of *family* time between work and leisure for married couples, and the total endowment of time available for singles (λ_S) is similar to the total endowment of time available at the family level for married couples ($\lambda_M + k_1\lambda_F$). Note that λ is the time that can be allocated between work and leisure after housekeeping (including child rearing) is finished. Each individual of a married couple generally spends more time than a single in housekeeping and child rearing, so λ_M and λ_F will be much smaller than λ_S. We do not think that the model with separate sub-utility functions for singles and married couples would produce very different results. Attitudes of singles towards redistribution may be different from those of married couples, not because they have different utility functions, but rather because singles have lower wage rates, on average, than married couples.

D. Government budget constraint

It remains to derive the government budget equation. We assume government revenues are used in financing lump-sum redistribution, b, and providing publicly provided goods, C, where the per capita spending on publicly provided goods is given and exogenous.

Note from equation (21) that taxable income W is positive only for individuals with $\hat{w} > \frac{B^*}{A^*}\frac{b}{1-t}$. This is because labor income is zero for individuals with low wages, given a positive tax rate and government transfers. Hence the government's budget constraint is

$$t\int_{\frac{B^*b}{A^*(1-t)}}^{\infty}\left(\frac{1}{1-k_3(1-B^*)}(A^*\hat{w}-B^*\frac{b}{1-t})\right)dF(\hat{w}) = b + C. \qquad (24)$$

The amount of transfer, b, is determined by solving the integral equation (24). The budget constraint will enable us to solve for b as a function of t, and we therefore write $b = b(t)$. Consequently, we now write policies as ordered pairs $(t,r) \in \mathbf{R}^2$. The policy space is two-dimensional.

Since the left-hand side expression of equation (24) is decreasing in b, the equation has a unique solution. If $C>0$, the function $b(t)$ is zero at a positive tax rate. The minimum tax rate that makes $b(t)$ positive is the solution t of the equation

$$t\int_{0}^{\infty}\left(\frac{A^*\hat{w}}{1-k_3(1-B^*)}\right)dF(\hat{w}) = C. \qquad (25)$$

Therefore, $t_{\min} = \frac{C(1-k_3(1-B^*))}{A^*\mu_w}$, where μ_w is the mean wage rate. We will estimate the transfer function $b(t)$, or Laffer curve, later in section 4; it is hump-shaped in t (see below). If t_{max} is the tax rate that maximizes $b(t)$, the equilibrium tax rates at PUNEEPs always lie in the interval $[t_{\min}, t_{\max}]$.

The indirect utility function, after substituting $b(t)$, is given by

$$v(t,r;\hat{w},\rho) = \tilde{\phi}(t;\hat{w}) - \frac{\gamma}{2}(r-\rho)^2 + (\delta_0 - \delta_2\rho)\tilde{E}(t), \qquad (26)$$

where $\tilde{\phi}(t;\hat{w}) = \phi(x(t,b(t),\hat{w}), L^f(t,b(t),\hat{w}))$ and $\tilde{E}(t) = Log\left(\frac{x(t,b(t),\hat{w}_{0.25})}{x(t,b(t),\hat{w}_{0.75})}\right)$. The function v, so defined, is the function $v: T \times H \to \mathbf{R}$ of the formal definition in section 3.A.

E. Computation of PUNEEP

Let $\tau = (t, r)$ be a policy vector. We compute that the set of types that prefer a policy $\tau^D = (t^D, r^D)$ to a policy $\tau^R = (t^R, r^R)$ is

$$\Omega(\tau^D, \tau^R) = \begin{cases} \{(\hat{w}, \rho) : \rho < \Psi(\hat{w}, \tau^D, \tau^R)\} & \text{if } \gamma(r^R - r^D) + \delta_2(\widetilde{E}(t^D) - \widetilde{E}(t^R)) > 0 \\ \{(\hat{w}, \rho) : \rho > \Psi(\hat{w}, \tau^D, \tau^R)\} & \text{if } \gamma(r^R - r^D) + \delta_2(\widetilde{E}(t^D) - \widetilde{E}(t^R)) < 0 \end{cases}, \quad (27)$$

where

$$\Psi(\hat{w}, \tau^D, \tau^R) = \frac{\widetilde{\phi}(t^D; \hat{w}) - \widetilde{\phi}(t^R; \hat{w}) + \frac{\gamma}{2}((r^R)^2 - (r^D)^2) + \delta_0(\widetilde{E}(t^D) - \widetilde{E}(t^R))}{\gamma(r^R - r^D) + \delta_2(\widetilde{E}(t^D) - \widetilde{E}(t^R))}. \quad (28)$$

The voting fraction for party D is defined by $\varphi(\tau^D, \tau^R) = \mathbf{P}(\Omega(\tau^D, \tau^R))$.

The typical case in Democratic-Republican equilibria is

$$\gamma(r^R - r^D) + \delta_2(\widetilde{E}(t^D) - \widetilde{E}(t^R)) > 0, \quad (29)$$

and in that case it follows from (27272727) that the expected vote share is

$$\varphi(\tau^D, \tau^R) = \int_0^\infty \int_0^{\Psi(w, \tau^D, \tau^R)} dG(\rho \mid w) dF(w) = \int_0^\infty G(\Psi(w, \tau^D, \tau^R) \mid w) dF(w). \quad (30)$$

(The other case can be studied in a similar manner by symmetry.)

However, we postulate that there is some uncertainty about how citizens will vote, due to abstention, misperception of policies by voters, scandals, and so on. Parties estimate the fraction of citizens who will vote for each party, but these estimates are subject to a margin of error. We summarize this by positing that there is only a *probability* that, if the voters are offered the choice (τ^D, τ^R), one policy will win. We only postulate that the probability that the *D* policy wins is a strictly increasing function of the expected vote share; that is

$$\pi(\tau^D, \tau^R) = \zeta(\varphi(\tau^D, \tau^R)), \quad (31)$$

where $\zeta : [0,1] \to [0,1]$ is a strictly increasing function.

Note that we can characterize the opportunists as wishing to maximize *expected vote share*, since probability of victory is just an increasing transformation of expected vote share.

This means that the policies in PUNEEPs are independent of the $\zeta(.)$. We utilize this below.

It follows that we can expand equations (8) and (9) as:

$$-\begin{pmatrix} \int_0^{\infty} g(\Psi(w,\tau^D,\tau^R)\,|\,w)\dfrac{\partial\Psi}{\partial t^D}dF \\ \int_0^{\infty} g(\Psi(w,\tau^D,\tau^R)\,|\,w)\dfrac{\partial\Psi}{\partial r^D}dF \end{pmatrix} = x^D \begin{pmatrix} \int_0^{\infty}\int_0^{\infty} q(w)\dfrac{\partial v}{\partial t^D}dG(\rho\,|\,w)dF \\ \int_0^{\infty}\int_0^{\infty} q(w)\dfrac{\partial v}{\partial r^D}dG(\rho\,|\,w)dF \end{pmatrix}, \qquad (32\text{ a \&b})$$

$$\begin{pmatrix} \int_0^{\infty} g(\Psi(w,\tau^D,\tau^R)\,|\,w)\dfrac{\partial\Psi}{\partial t^R}dF \\ \int_0^{\infty} g(\Psi(w,\tau^D,\tau^R)\,|\,w)\dfrac{\partial\Psi}{\partial r^R}dF \end{pmatrix} = x^R \begin{pmatrix} \int_0^{\infty}\int_0^{\infty} q(w)\dfrac{\partial v}{\partial t^R}dG(\rho\,|\,w)dF \\ \int_0^{\infty}\int_0^{\infty} q(w)\dfrac{\partial v}{\partial r^R}dG(\rho\,|\,w)dF \end{pmatrix}, \qquad (33\text{ a \& b})$$

where $g(.\,|\,w)$ is the density of $G(.\,|\,w)$.

We turn to discuss the weight function $q(.)$ given in equations (3) and (4). Because the rich contribute disproportionately more than the poor, we take the weight functions to be convex up to a cap. In particular, we specify that for both parties the weight function is given by

$$q(w) = \begin{cases} \hat{q}(w) = q_0 + q_1 \exp(q_2 w) & w \le w_{cap} \\ 1 & w > w_{cap} \end{cases}, \qquad (34)$$

where $\hat{q}(w)$ satisfies $\hat{q}(0) = 0$ and $\hat{q}(w_{cap}) = 1$, which implies that $q_1 = \dfrac{1}{\exp(q_2 w_{cap}) - 1}$ and $q_0 = -q_1$. We set w_{cap} as the 99th centile of the wage rate distribution. (So all individuals whose incomes are greater than the 99th percentile have equal weights.) The value of q_2 is estimated using Bartels' (2002) result that constituents at the 75th percentile of the income distribution have three times as much influence as those at the 25th percentile .

We compute the *bargaining power* of the two factions in each party at a PUNEEP. Suppose α^J_{opp} is the Nash bargaining weight of the opportunist faction in party J and τ^J is the equilibrium party platform of party J. Then the relative bargaining power of militants against opportunists in party J is

$$\frac{1-\alpha^J_{opp}}{\alpha^J_{opp}} = x^J \frac{V^J(\tau^J) - V^J(\tau^{J'})}{\pi^J(\tau)}, \qquad (35)$$

where $J = D, R$, $J' \neq J$, $\tau = (\tau^D, \tau^R)$. See Roemer (2001, Chapter 8) for the derivation.

F. The policy bundle effect and the anti-solidarity effect

We provide a preview of our strategy. In section 4, we will estimate the distribution of types and all the parameters of the utility function as accurately as possible. Our model specification at

these estimated values will be extremely good in predicting observed values. We then perform two counterfactual experiments.

First, we counterfactually run an election in which taxation is the only policy. Thus, we assume that the government's racial policy is exogenously fixed at some $r = \bar{r}$. This is equivalent to assuming that $\gamma = 0$. In this experiment, the phenomenon of poor, racist voters voting Republican because the Republicans put forth racist positions (i.e., the policy bundle effect) *will not exist*, because neither party offers a position on race. However, voters will still be equipped with their anti-solidaristic preferences, which are, in part, a consequence of racism, and those continue to influence the equilibrium tax rate.

The difference between the tax rates in the equilibria of this counterfactual and the tax policy in the full model is the *policy bundle effect* of racism.

We next run a second experiment in which we continue to assume that the race issue is not a policy issue; we also now assume that all voters have non-racist preferences -- that is, we assign the lowest possible value of ρ, i.e., ρ_{min}, to all voters. We again compute PUNEEPs by solving equations (32a) and (33a). The tax policies in these PUNEEPs are what we predict taxes would be if racial attitudes were *neither* reducing solidarity among citizens *nor* were the policy bundle effect active.

Schematically, our decomposition procedure is as follows. Let t^J be equilibrium tax policy for party J. Then for each party J the total effect of voter racism on the tax rate can be decomposed into[28]:

$$\begin{aligned} & t^J(\text{full model}) - t^J(r = \bar{r}, \rho = \rho_{min}) && \text{total effect} \\ = \quad & t^J(\text{full model}) - t^J(r = \bar{r}) && \text{policy bundle effect} \\ + \quad & t^J(r = \bar{r}) - t^J(r = \bar{r}, \rho = \rho_{min}) && \text{anti-solidarity effect.} \end{aligned} \tag{36}$$

One could say that the degree of redistribution *sans* the anti-solidarity effect and the policy bundle effect is what democratic politics would produce in the United States if the polity were as racially homogeneous as, let us say, Norway was before 1970.

One may carry out a similar decomposition analysis for vote share. We just point out that changes in voter racism affects vote shares through *two* channels; first *directly* through its effect

[28] It is well known that the order of decomposition is not unique, and so researchers usually compute each effect by taking the average of the effects obtained from all possible orders of the decomposition. We do not do this because the computation is quite intensive and the difference due to different orders of decomposition is usually not large.

on changes in preferences and second *indirectly* through its effect on changes in the parties' platforms.

We conclude this section with a methodological remark. Consider the utility function (26) and suppose that an individual derives from the policy of party J the random utility of

$$v^J = \widetilde{\phi}(t^J, w) - \frac{\gamma}{2}(r^J - \rho)^2 + (\delta_0 - \delta_2\rho)\widetilde{E}(t^J) + \varepsilon^J, \tag{37}$$

where J=D, R is an index for a party, and ε^J is a random error term. Then at the observed vector of platforms $(t^D_{obs}, t^R_{obs}, r^D_{obs}, r^R_{obs})$ (we leave aside the problem of how to compute these policies for the time being), the individual will vote party R if and only if

$$\begin{aligned}\varepsilon^D - \varepsilon^R < -\left[\widetilde{\phi}(t^D_{obs}, w) - \widetilde{\phi}(t^R_{obs}, w)\right] + \frac{\gamma}{2}\left[(r^D_{obs} - \rho)^2 - (r^R_{obs} - \rho)^2\right] \\ - \delta_0[\widetilde{E}(t^D_{obs}) - \widetilde{E}(t^R_{obs})] + \delta_2\rho[\widetilde{E}(t^D_{obs}) - \widetilde{E}(t^R_{obs})].\end{aligned} \tag{38}$$

Note that $(r^D_{obs} - \rho)^2 - (r^R_{obs} - \rho)^2$ can be expanded into $2(r^D_{obs} - r^R_{obs})(\frac{r^D_{obs} + r^R_{obs}}{2} - \rho)$. Rearranging terms of (38) while using this expansion, we have

$$\varepsilon^D - \varepsilon^R < \left[\widetilde{\phi}(t^R_{obs}, w) - \widetilde{\phi}(t^D_{obs}, w)\right] + [\delta_2(\widetilde{E}(t^D_{obs}) - \widetilde{E}(t^R_{obs})) - \gamma(r^D_{obs} - r^R_{obs})]\rho + \text{constant} \tag{39}$$

The first term on the right-hand side of expression (39) is a function of w while the second term is a function of ρ. If one assumes that the term $\left[\widetilde{\phi}(t^R_{obs}, w) - \widetilde{\phi}(t^D_{obs}, w)\right]$ can be approximated by a linear (or log-linear) function of income and other demographic variables such as education, and $\varepsilon^* \equiv \varepsilon^D - \varepsilon^R$ is distributed by a distribution function Φ, one may be able to run a binary choice regression model with variables measuring income, racial position, and other controls.

But as is clear from equation (39), what can be estimated is the size of $\delta_2(E(t^D_{obs}) - E(t^R_{obs})) - \gamma(r^D_{obs} - r^R_{obs})$. This is an identification problem in econometrics, but points out an important issue in empirical studies on the politics of race. Many empirical researchers set similar specifications to (39) to determine the effect of 'racism' on voting behavior, and our regression (5) in Table 2-3 is also of this type. But as equation (39) shows, the coefficient of ρ combines two effects (the policy bundle effect and the anti-solidarity effect), because it involves both δ_2, associated with the anti-solidarity effect, and γ, associated with the policy bundle effect. Without an equilibrium theory like ours, one cannot distinguish these two effects.

4. Estimation of the Data in the Model

We estimate the parameter values of the utility function, marginal tax rates and transfer payments, the joint distribution of voter traits, and the observed policies of the two parties, etc., using two sources of micro data: the Panel Study of Income Dynamics (PSID) and the National Election Studies (NES). The estimation is carried out for each presidential election year between 1976 and 1992. We briefly describe our estimation procedure below. The estimated values of the model parameters are summarized in Table A-4-3 in Appendix 1.

Parameter values will be estimated for each year, but densities and thus our numerical computation will be based upon four sets of data pooled over two adjacent election years; 1976-80, 1980-84, 1984-88, and 1988-92. The reason for this is twofold.

First, having accurate density estimates for the distribution of voter types is very important for improving the fit of our model; a small number of samples will increase the bias of our density estimates significantly. The sample size problem is particularly serious for estimating 'racism-induced aid-to-blacks.' The number of sample points for the racism-induced aid-to-blacks is only about 350 per year. By pooling samples of adjacent years, we double the sample size.

Second, by pooling samples in two adjacent election years, we have relatively *stable* results that will not be driven by year-specific political issues (e.g., candidate personality), which we did not model.

A. Distribution of voter types

In our model, voters are characterized by a trait vector $(\hat{w},\rho)$. We define ρ to be the racism-induced aid-to-blacks that we constructed in section 2. Recall from section 2 that racial attitudes are not significantly influenced by income. (See also Table A-2-3 in Appendix 1.) This suggests that we can estimate the joint distribution of voter traits by estimating $f(w)$ and $g(\rho)$ separately.

Indeed, when we examine the conditional densities $g(\rho \mid w)$ we do not find a significant difference across income groups. (See Figure A-4-2 in Appendix 1.) We formally tested the independence assumption using two non-parametric test statistics. First, we compute the Kolmogorov-Smirnov similarity statistic (see Appendix 3) for each pair of conditional densities to see whether they differ across income groups. (The computed KS statistics and p-values are presented in Table A-4-4 in Appendix 1.) Except in a few cases, we were unable to reject the hypothesis that a pair of two conditional densities is identical. Second, we calculate the T_1 statistic suggested by Ahmad and Li (see Pagan and Ullah (1999; p.71) and Appendix 3 in this paper); we

were again unable to reject the null hypothesis of independence against the alternative of dependence.[29]

We estimate the distribution of ρ for whites non-parametrically using the Rosenblatt-Parzen kernel density estimation method. (See Appendix 3 for details.) We assigned ρ =l to all blacks in section 2, but for the sake of numerical computation which needs a continuous density function, we assigned the normal distribution with mean 1 and small variance that makes the actual support for blacks become [0.5, 1.5). The entire distribution of the variable ρ is constructed as the weighted sum of the two races' density functions, where weights are given by population fractions reported in Table A-4-3 in Appendix 1.

Next we turn to the estimation of the real wage rate. In the NES, voters are classified into five income groups according to their percentile pre-fisc family incomes: 0-16 percentile, 17-33 percentile, 34-67 percentile, 68-95 percentile, and 96-100 percentile. This classification is not fine-grained enough to estimate continuous marginal distribution of incomes. Furthermore, information on wage rates or working hours is completely absent in the NES. Hence in estimating the real wage rates, we rely upon an independent source: the PSID.

The PSID sample consists of two independent samples: a cross-sectional national sample drawn by the Survey Research Center (SRC) and a sample of low-income families drawn from the Survey of Economic Opportunity (SEO); the latter sample is confined to Standard Metropolitan Statistical Areas (SMSA's) in the north and non-SMSA's in the southern region. To avoid the risk of over-sampling poor families, we drop the SEO sample, and base our calculation only on the SRC sample with positive taxable incomes.[30] The PSID dataset in year *s* pertains to calendar year *s*-1; the labor market data for year *s* below were constructed from the PSID dataset in year *s*+1. The last election year in the current paper is 1992. But the last year for which we can calculate income taxes, post-fisc income and pre-fisc income from PSID is 1990 (using the 1991 PSID). Hence for 1992, we had to use the labor market information in 1990 contained in PSID 1991.[31]

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[29] Indeed estimating a fully bivariate density when the correlation between the two variables is very weak does more harm than good, because kernel estimates of joint densities are in general inaccurate unless the sample size is large. Silverman (1986; pp. 92-3) describes the 'empty-space phenomenon' where very few points are around the origin when the dimension is greater than 1.

[30] Positive taxable income at the family level does not necessarily mean that the wage rate earned by the male.in the family is positive.

[31] Is the distribution of incomes among respondents in the NES close to the distribution of incomes among respondents in the PSID? We compared percentile incomes in the NES with the corresponding percentile incomes in the PSID; we find that they are very similar. (See Table A-4-2 in Appendix 1.)

Our real wage rate is thus the nominal wage rate computed from the PSID, adjusted by the CPI index (normalized to the 1984 level). (For the Consumer Price Index, see Table A-4-1 in Appendix 1.) The density and distribution of the real wage rates are non-parametrically estimated, again by the kernel method.

After estimating the two marginal densities separately, we take the joint density to be their product.[32]

Figure 4-1 shows the estimated densities together with their 95% asymptotic confidence intervals for two periods (see Appendix 3 again for formula). It turns out that the marginal densities are quite tightly estimated.

Figure 4-2 shows the estimated distribution of racism-induced aid-to-blacks for several years; the first panel shows the densities and the second panel the distribution functions.

Note that the distribution of racism-induced aid-to-blacks has changed over time. Racial conservatism, so measured, decreased from 1976 to 1984 but increased in 1992.

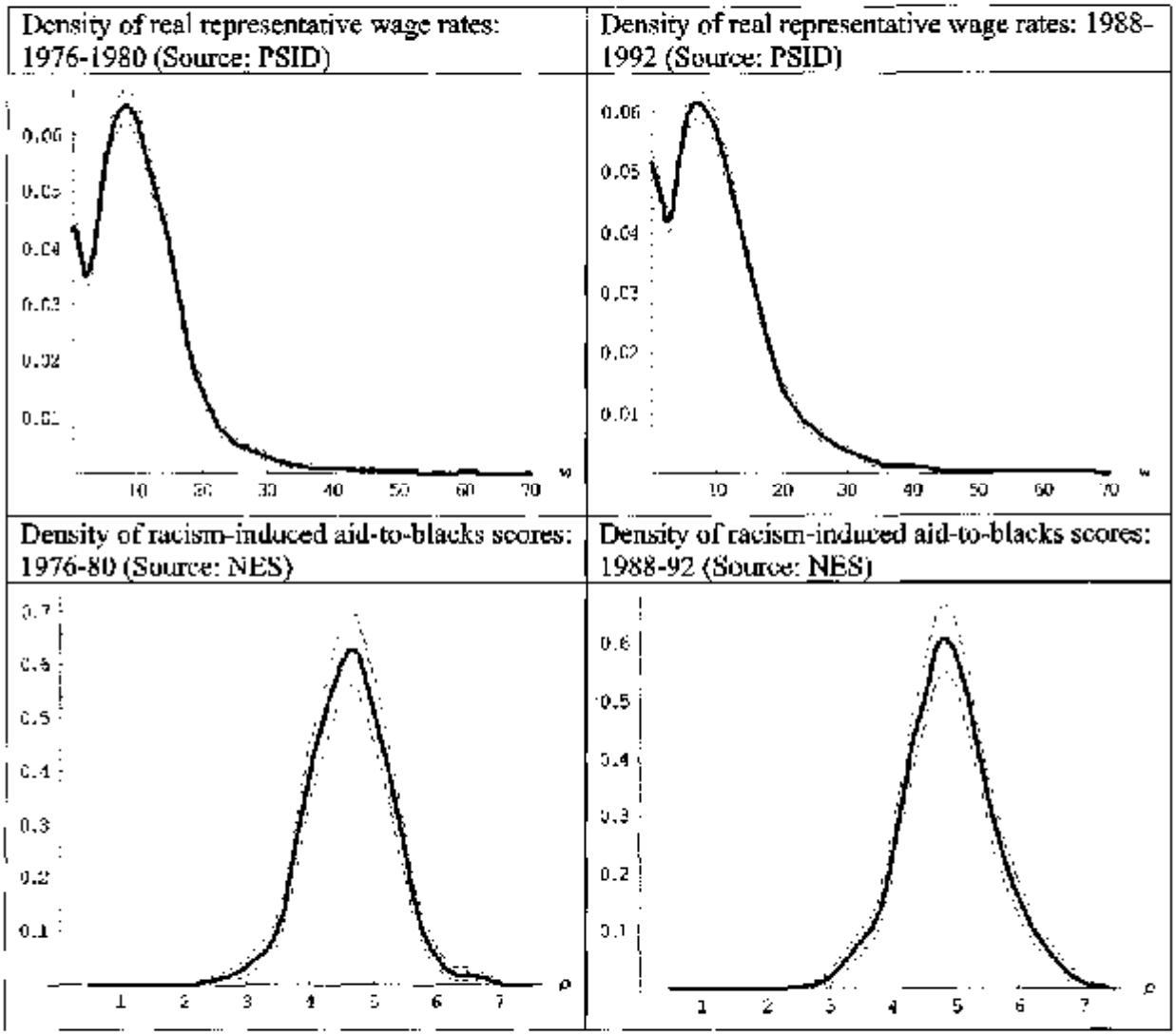
B. Estimation of observed tax rates and transfer payments (t_{obs} and b_{obs})

To calculate the observed marginal tax rates and transfer payments consistent with the affine tax scheme of our model, we regress post-fisc family income on pre-fisc family income with a constant term; then the slope coefficient is $(1-t)$ and the constant corresponds to b.

To run the regressions, we need to estimate post-fisc incomes. To calculate post-fisc family income, we first subtracted federal income taxes, social security taxes (paid by employees) and Medicare taxes (paid by employees) from the taxable (i.e., pre-fisc) family income, and then added government transfer payments received by each family.

[32] Another way of constructing the joint density for the entire population is to form bivariate densities separately for whites and blacks and then add these two densities with weights according to their population weights. In drawing pictures, we used this method (see Figure A-4-3 in Appendix 1); in numerical computations, however, we use the first method because it saves on computation time.

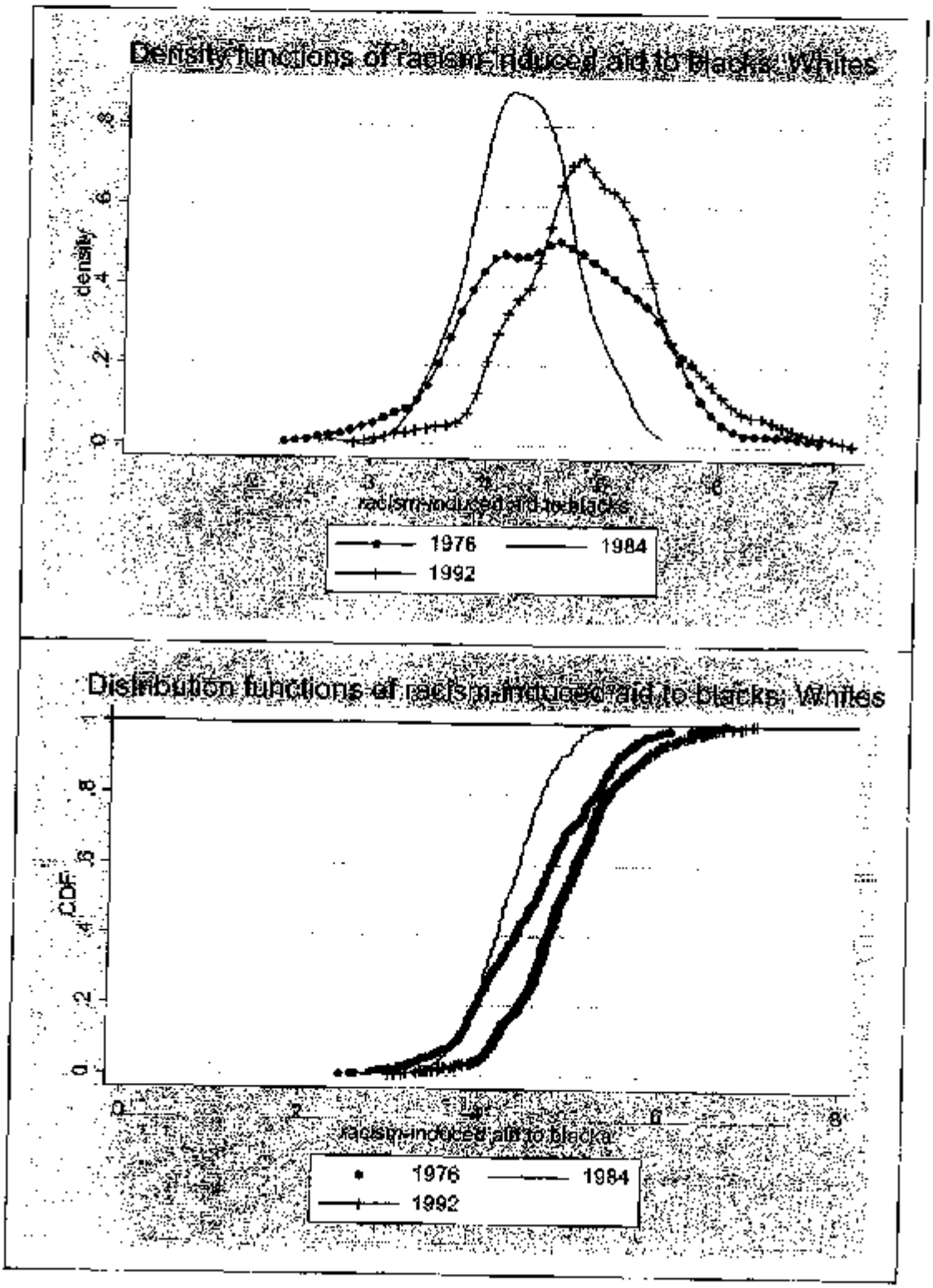
Figure 4-1: Kernel density estimates of voter types and their 95% asymptotic confidence intervals: 1976-1980 and 1988-92, Whites only



Note: (1) Thick solid lines are density estimates, and thin dotted lines are upper and lower bounds of 95% confidence intervals. (See Appendix 3.)

(2) Kernel=Gaussian, bandwidth= $h = 0.9 * n^{(-1/5)} Min[Var, \frac{IQR}{1.349}]$, where n is the number of samples, *Var* is the variance, and *IQR* is the inter-quartile range.

Figure 4-2: Distribution of racial policy attitude: Whites only (Source: NES)



Federal income taxes paid by each household are already provided in PSID, but the other two taxes are not. We calculated them using the social security and Medicare tax rate table. (See Table A-4-1 in Appendix 1.) Since an individual's retirement benefits are linked to past social security tax payments, treating all social security taxes as pure taxes is problematic. We treat the employee contribution as a pure tax, and ignored the employer contribution as in Triest (1990).

For government transfers, we included the following: AFDC, SSI (Supplemental Security Income), other welfare, VAP (Veterans Administrations Pension), other retirement benefit, unemployment benefit, worker's compensation, child benefit, government subsidy for heating costs, and monetary value of food stamps.[33]

The regression results are reported in Table 4-1 and Figure 4-3.

Several remarks can be made from Table 4-1 and Figure 4-3.

First, one might conjecture that the linear regression is problematic because fiscal policies in the United States are progressive. But Figure 4-3 shows that the linear fit is extremely good. The R^2 is higher than 0.90 in almost all years, and the regression with the quadratic or cubic terms does not add much explanatory power. Indeed Figure 4-3 compares our linear fit with non-parametric fits based on locally weighted smoothing (lowess) with two different bandwidths. Although post-fisc income is slightly concave in pre-fisc income in 1976 and slightly convex in 1990, the linear fit does an excellent job. One cannot tell the difference between them except in the range where very few high income samples exist as outliers.

Second, the marginal tax rates increase until 1980, and then decline gradually. The decline was especially remarkable in 1984 and 1988, a consequence of two tax reforms introduced by the Reagan administration, the Economic Recovery Tax Act of 1981 and the Tax Reform Act of 1986.

Third, as the marginal tax rates decline over time, the transfer payments also decline in real terms. As the last column of Table 4-1 indicates, the transfer payments calculated in real terms using the Consumer Price Index (1984=100) declined from $6609.9 in 1976 to $5295.6 in 1990.

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[33] There may be some bias in our estimated post-fisc incomes. First, taxes reported in the PSID are calculated after taking out exemptions but not deductions. Also the post-fisc income does not include tax credits (such as child credit, or EIC). These two facts will generate a downward bias in the estimated post-fisc incomes.
Second, we are unable to include the housing rent subsidy, and the monetary value of public education or public health (such as Medicaid), because there is no information about their value. This will also generate downward bias in the estimated transfer amounts and hence post-fisc incomes.

Table 4-1: Estimation of marginal tax rates and transfer payments (Source: PSID)

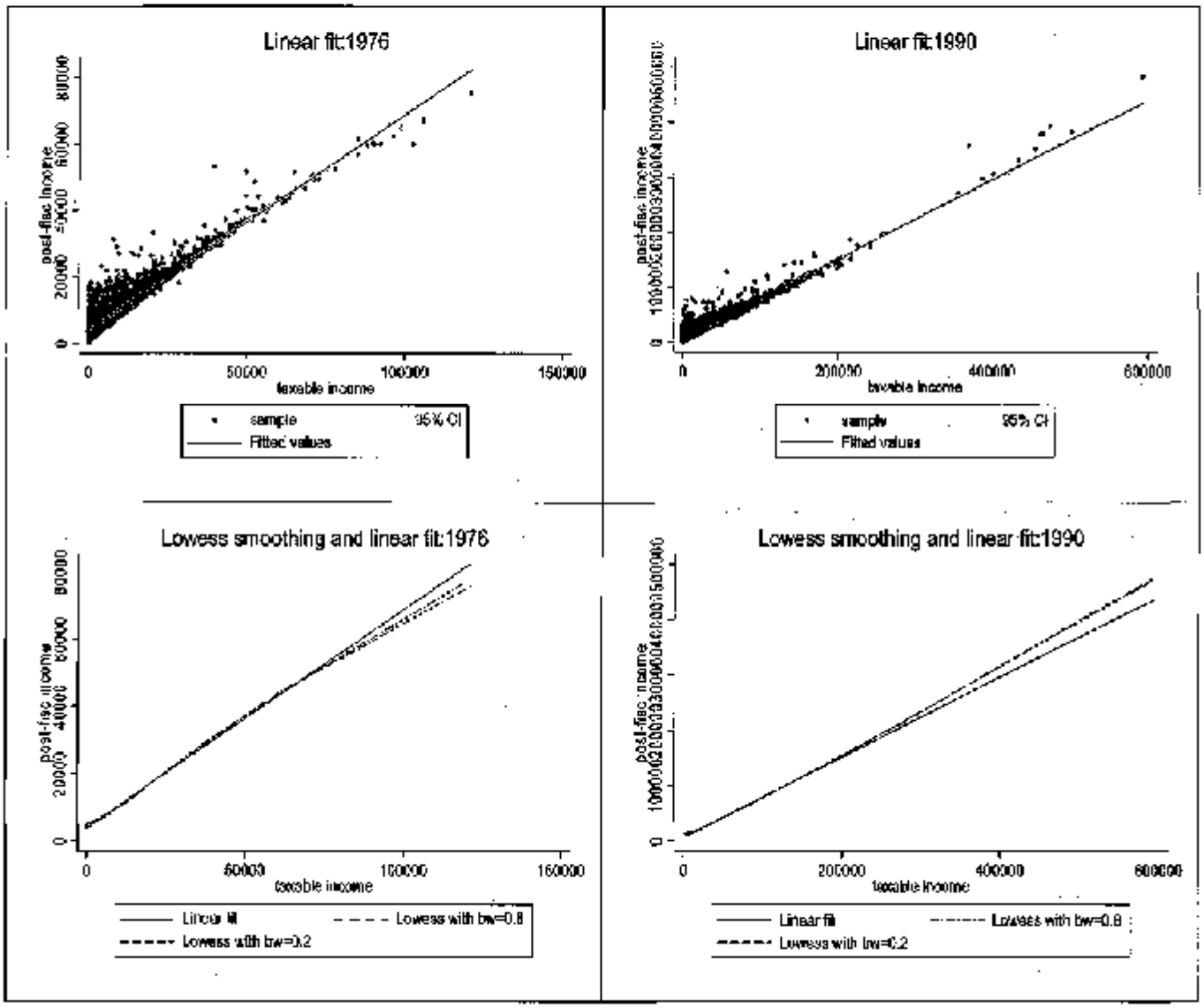
Year	Source	b	(1-t)	R^2	Obs	Marginal tax rate	CPI-adjusted transfers (1984=100)
1971	PSID 1972	2230.54 (42.41)	0.6927 (172.95)	0.9174	2695	0.3073	5953.1
1972	**PSID 1973**	**2341.2 (44.94)**	**0.6926 (185.7)**	**0.9268**	**2725**	**0.3074**	**5819.3**
1975	PSID 1976	3379.2 (51.63)	0.6481 (175.98)	0.9119	2995	0.3519	6525.9
1976	**PSID 1977**	**3619.9 (52.33)**	**0.6504 9(183.22)**	**0.9161**	**3077**	**0.3496**	**6609.9**
1979	PSID 1980	4938.8 (48.72)	0.6246 (157.33)	0.8828	3288	0.3754	7067.9
1980	**PSID 1981**	**5198.7 (50.81)**	**0.6278 (167.26)**	**0.8955**	**3268**	**0.3722**	**6555.0**
1983	PSID 1984	5643.9 (44.38)	0.6820 (197.5)	0.9202	3386	0.3180	5887.7
1984	**PSID 1985**	**5807.7 (45.97)**	**0.6796 (219.06)**	**0.9338**	**3405**	**0.3204**	**5807.7**
1987	PSID 1988	5920.1 (39.24)	0.7102 (229.18)	0.9378	3485	0.2898	5414.5
1988	**PSID 1989**	**6273.3 (39.44)**	**0.7192 (233.07)**	**0.9398**	**3479**	**0.2808**	**5509.8**
1990	**PSID 1991**	**6661.1 (38.21)**	**0.7207 (234.08)**	**0.9397**	**3518**	**0.2793**	**5295.6**

Note: (1) The estimation is based on the following linear regression:

$$(\text{Post - fisc income}) = b + (1-t)(\text{Pre - fisc income}).$$

(2) Numbers in parentheses are t-values.

Figure 4-3: Goodness-of-fit of the regression line estimating the marginal tax rate (Source: PSID)



Finally, one may wonder whether the time variation in estimated tax rates is due either to varying sample sizes or sample units, not to real changes in fiscal policy. To see whether our estimation is driven purely by different samples, we also estimated the tax-transfer in adjacent years. As reported in Table 4-1, the observed tax rates are almost identical in adjacent years. Hence the changes in tax rates over time in Table 4-1 can be considered to reflect real changes in fiscal policies in the United States.[34]

C. Parameter values of the sub-utility function

In Table A-4-3 in Appendix 1, we also report the wage rates of males and females, labor incomes and other incomes. They are used in calculating the ratios of female wage rates to male wage rates (k_1) and of non-wage incomes to total pre-fisc incomes (k_3). In 1984, for example, k_1 is about 0.49, and k_3 is about 0.12. The ratio of the female wage rate to the male wage rate has gradually increased from 0.44 in 1976 to 0.58.[35] The proportion of asset income in total taxable income has also increased over time but that increase is not significant; it is approximately 10-12% for all years.

Using an average ratio, such as k_1, to convert the female wage rate to the wage rate of males may hide the wide dispersion between them. But when we compare the density of male wage rates with the density of female wage rates multiplied by $1/k_1$, for samples with positive wage rates, the two densities are strikingly similar (not reported). Hence converting the three dimensional type space (w_M, w_F, ρ) into the two-dimensional space (w_M, ρ) for married couples does not discard much information.

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[34] In Table A-4-3 in Appendix 1, we report income inequalities measured by both the Gini coefficient and the Theil coefficient. First, pre-fisc income inequality, measured by the Gini coefficient and the Theil coefficient was quite stable until 1980, but started to rise after that. The Gini coefficient for pre-fisc income was about 0.41-0.42 until 1980, but became 0.4351 in 1984, 0.4489 in 1988 and 0.4627 in 1990. The same tendency is observed with the Theil coefficient. (Although not reported here, inequality in wage rates shows the same pattern. The Gini coefficients of the male-head wage rates changed from 0.3216 in 1972 to 0.3186 in 1980 to 0.3608 in 1990.) Second, redistributive fiscal policy in the United States has reduced the Gini coefficient of pre-fisc incomes by about 8-10 percentage points depending on the year, and the lowest effect (8 percentage point) is observed in 1988, two years after the Tax Reform Act of 1986.

[35] Two factors explain the gradual increase. First, female labor force participation has increased, which has increased the fraction of females who earn positive wages, and many female workers moved from part-time to full time. Second, the wage rates for female employees relative to those of male employees have improved. The ratio k_1 is somewhat higher if we confine to samples of working individuals. It was about 0.51 in 1984 for samples with working individuals, but the general tendency is the same. .

Table A-4-3 also reports the estimated value of C, which is equal to the difference between the mean of pre-fisc and post-fisc incomes. (If tax revenues are completely redistributed, then C must equal zero, because in that case, the sum of pre-fisc incomes across families is equal to the sum of post-fisc incomes.)

It remains to estimate the parameter vector that characterizes the labor supply functions, $(\beta_M, \beta_F, \lambda_M, \lambda_F)$. Hausman (1981) and Triest (1990) estimated uncompensated wage elasticities of labor supply for both males and females for 1976 (Hausman) and 1984 (Triest) using non-reduced form labor supply functions, which correspond to equations (14) and (15) in our model, and using the same methodology and the same dataset, PSID. These elasticities are reported in Table A-4-3.[36]

Their estimates are based upon the assumption that husbands do not take into account the labor income of wives (i.e., $Y_F = w_F L_F$ in our model) in making their labor supply decision, while wives do take into account the labor income of husbands. In the context of our model, the elasticities computed from non-reduced form equations (14) and (15) are:

$$\xi_M = \frac{\partial \log L_M}{\partial \log w_M} = \frac{\frac{\beta_M}{1+\beta_M}\left(\frac{b}{1-t} + Y_F + O\right)\frac{1}{w_M}}{L_M}, \tag{40}$$

$$\xi_F = \frac{\partial \log L_F}{\partial \log w_F} = \frac{\frac{\beta_F}{1+\beta_F}\left(\frac{b}{1-t} + Y_M + O\right)\frac{1}{w_F}}{L_F}, \tag{41}$$

where

$$L_M = \frac{\lambda_M}{1+\beta_M} - \frac{\beta_M}{1+\beta_M}\left(\frac{b}{1-t} + Y_F + O\right)\frac{1}{w_M}, \tag{42}$$

$$L_F = \frac{\lambda_F}{1+\beta_F} - \frac{\beta_F}{1+\beta_F}\left(\frac{b}{1-t} + Y_M + O\right)\frac{1}{w_F}. \tag{43}$$

We use the Triest estimates for all years since 1984 and the Hausman estimates for 1976 and 1980 (assuming that the elasticity of labor supply does not change much over time). We estimate the four parameters $(\beta_M, \beta_F, \lambda_M, \lambda_F)$ by solving the above four equations simultaneously while setting $Y_F = 0$ and substituting yearly estimated values of t and b and the mean values of working hours, O, Y_M, w_M and w_F into the equations.

Once the distribution of voter types and parameter values for the sub-utility function are estimated we can estimate the Laffer curve in the model. Figure 4-4 shows the estimated Laffer

curves together with the observed policy pair (t_{obs}, b_{obs}) (estimated by the average value of two years). We also computed, by a bootstrapping method, the asymptotic confidence interval of the Laffer curve by considering only the estimation errors inherited from the estimation of the wage distribution.[37] (The actual confidence interval would be wider than shown here if we considered estimations errors inherited from parameter values.)

The solid line represents the Laffer curve based on our non-parametric estimation of the wage distribution. The fit of our model is remarkably accurate; the observed fiscal policy (the large dot) lies very close to the estimated Laffer curve for all periods! For the sake of comparison, we also estimated the Laffer curve based on the lognormal wage distribution function, two parameters of which are estimated from the data (the dotted curve). (The two parameters are estimated by minimizing the L_2-norm of the difference between the lognormal density and the kernel density.) Supremacy of the non-parametric estimation method is clear.[38]

D. Observed policies, observed vote share, and observed party membership

Observed policies of the two parties, observed vote share, and observed party membership are also estimated using both the PSID and the NES.

(1) Observed vote share

Observed vote share is taken from two sources: the Statistical Abstracts of the United States and the NES. In both cases, we take as the population citizens voting for either party D or party R. The former source provides the exact historical vote share whereas the latter provides the vote share based upon respondents' report. Both are summarized in Table A-4-3. Table A-4-3 shows that the NES vote share is quite close to the actual vote share.

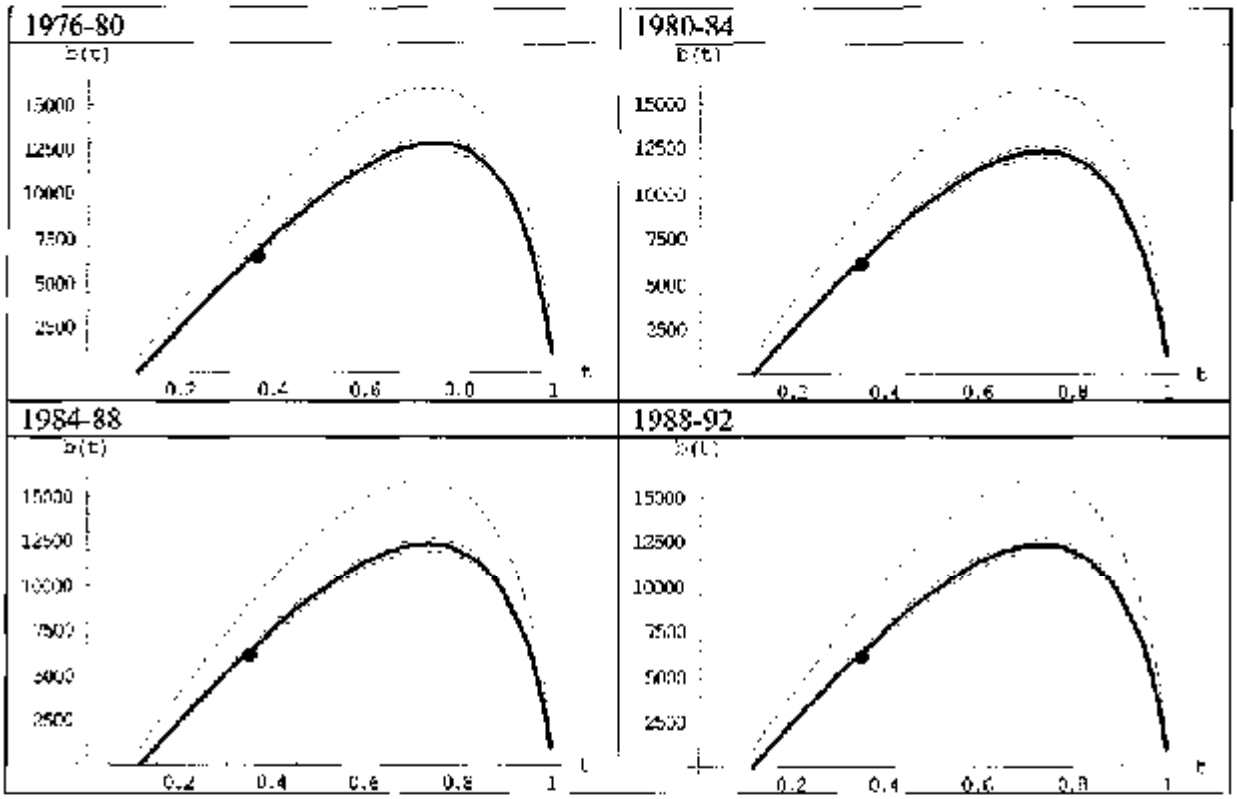
(2) Observed racial policy (r^D_{obs} and r^R_{obs})

[36] They estimate elasticities by several methods; we chose those elasticities recommended in Blundell and MaCurdy (1991).

[37] The bootstrap sample size is 1000.

[38] The tax rate that maximizes the Laffer curve is about 0.71-0.74, which is very high.

Figure 4-4: The estimated transfer function (Laffer curve), the function *b(t)*



Note: (1) The solid line represents the estimated Laffer curve when the wage distribution is estimated non-parametrically. The dotted line represents the estimated Laffer curve when the wage distribution is assumed to be lognormal and its two parameters are estimated by minimizing the L_2-norm of the difference between the lognormal density and the kernel density.

(2) The big black dot in the graph represents (t_{obs}, b_{obs}) estimated from the data in section 4. (See Table A-4 in Appendix A.)

(3) The precise values of b_{obs} and $b(t_{obs})$, and t_{max} for other years are as follows:

	76-80	80-84	84-88	88-92
b_{obs}	6582.45	6181.35	5685.75	5402.70
$b(t_{obs})$	6815.52	6353.38	5860.17	5459.48
t_{max}	0.745	0.732	0.714	0.711

The NES provides information on the public perception about the presidential candidates' position on aid-to-blacks, which we have seen in section 2 (see Figure 2-1). Assuming that voters are perceptive, we took the mean values as the candidates' positions on the racial issue.

(3) Observed fiscal policy (t^D_{obs} and t^R_{obs})

Estimating the tax policy of the two political parties is the most difficult part. Tax rates 'announced' by parties are rarely observable.

We simply assume that the observed fiscal policy vector before the enactments of the two major Reagan tax reforms is the policy vector close to the announced policy of party D, whereas the policy vector after the reforms is close to the announced policy of party R. Indeed, the fiscal system in the US was basically unchanged between the New Deal and the early 1980s.

Hence we take the viewpoint that party D's announced policy vector is (no less than) the observed policy vector in 1980 in Table 4-1 (with the marginal tax rate of 37.2%) and party R's observed policy vector is (no higher than) the observed policy vector in 1990 (with the marginal tax rate of 27.9%).

(4) Observed party membership

Our model identifies those who vote for a party with its membership, in equilibrium. It is useful to look at how party membership is distributed over voter types. We calculate the party membership probabilistically from the NES by looking at the fraction of citizens voting for party J in each of the 25 discrete voter types. The observed party membership for party D calculated in that way will be compared with the equilibrium party membership later (see Figure 5-3, for instance). As is clear from Figure 5-3, the more liberal on the racial issue and the poorer a citizen is, the more likely he/she belongs to party D.

E. Remaining parameters

There remain three un-estimated parameters in the utility function related to the equality term and the salience of racial issue: $(\delta_0, \delta_2, \gamma)$.

We apply equation (39) to estimate some of them. Recall that we cannot estimate all these parameters with regression techniques because of an identification problem. First, we can only

estimate the size of $\delta_2(E(t^D_{obs}) - E(t^R_{obs})) - \gamma(r^D_{obs} - r^R_{obs})$, which gives a linear relationship between δ_2 and γ. Second, we cannot estimate δ_0 because it is absorbed into the constant term.

This procedure reduces the dimension of the remaining parameter space to two. To further reduce the dimension of the parameter space, we impose the following condition: $\varphi(t^D_{obs}, t^R_{obs}, r^D_{obs}, r^D_{obs}; \delta_0, \delta_2, \gamma) = \varphi_{obs}$. Thus we have one degree of freedom in the choice of parameters.[39] The justification for this constraint is that our full model must be correctly specified at least in one aspect, to make our counterfactual experiments meaningful. As we have seen earlier through the tight fit of the Laffer curve (Figure 4-4), our model is very well specified on the economic side.

We ran probit regressions to estimate the size of $\delta_2(E(t^D_{obs}) - E(t^R_{obs})) - \gamma(r^D_{obs} - r^R_{obs})$, which appears as the size of the coefficient on the racism-induced aid-to-blacks. The results are reported in Table 4-2.

Perception about the performance of the economy in the past is an important explanatory variable for vote shares of all years. Dropping this variable will cause some bias for the estimated coefficient. Unfortunately, information on this variable is not available for 1976. We ran two regressions, one with the past-economy variable as a regressor (except 1976-1980) and the other without it. The coefficients are slightly different. We use the estimated coefficients from the regressions with the past-economy variable included, except for 1976-80.[40]

5. Numerical solution of the model

We carry out the computation separately for 4 periods: 1976-80, 1980-84, 1984-88, and 1988-1992. Finding equilibrium values for all three models requires about 1000 iterations for each set of parameter values in each period.

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[39] This constraint is not tautological, because we are imposing the condition that the vote share our model predicts at the *observed* platform be equal to the observed vote share. We will compute the equilibrium platforms and the predicted vote share at the *equilibrium* value, and compare this to the observed vote share.

[40] Thus there may be some bias in our estimated coefficients in this period

Table 4-2: R vote share weighted probit regression (Source: NES)

	(1)76-80	(2)80-84	(3)84-88	(4)88-92
racism_induced_aidtoblacks	0.193+ (1.94)	0.695** (3.98)	0.741** (6.41)	0.584** (6.06)
libertarianism	0.149* (2.42)	0.134+ (1.83)	-0.146* (2.19)	-0.032 (0.58)
compassion	-0.300** (4.88)	-0.253** (3.38)	-0.142* (2.03)	-0.270** (4.38)
feminism	-0.234** (3.77)	-0.217** (2.79)	-0.430** (5.71)	-0.658** (9.70)
logrealwage	0.104 (1.25)	0.219* (2.24)	0.283** (3.29)	0.160* (2.14)
education1==1	-0.796** (2.98)	-0.030 (0.08)	-0.194 (0.49)	-0.589+ (1.66)
education1==2	-0.399* (2.53)	0.173 (0.89)	0.033 (0.19)	-0.282+ (1.91)
education1==3	-0.236 (1.47)	0.153 (0.81)	0.329* (1.97)	0.154 (1.04)
upmobile	0.076 (0.48)	0.272 (1.38)	0.266+ (1.65)	0.205 (1.33)
downmobile	0.132 (0.66)	0.398 (1.42)	-0.537 (1.02)	0.005 (0.02)
pasteconomy*incumbentisR		-0.218** (2.98)	-0.237** (4.97)	-0.239** (5.06)
blackdummy	-1.237** (2.67)	0.375 (0.54)	1.005* (2.07)	0.691 (1.56)
femaledummy	-0.054 (0.46)	0.031 (0.08)	0.080 (0.60)	0.003 (0.03)
marrieddummy	0.202 (1.48)	0.106 (0.64)	0.002 (0.01)	0.159 (1.26)
unemployeddummy	0.178 (0.62)	-0.011 (0.03)	-0.354 (0.98)	-0.391 (1.37)
unionmemdummy	-0.352** (2.59)	-0.536** (3.08)	-0.530** (3.31)	-0.108 (1.31)
protestantism	0.096 (1.23)	0.129 (1.34)	0.126 (1.50)	0.214** (2.81)
respondent age	-0.002 (0.21)	-0.023* (2.12)	-0.006 (0.62)	0.006 (0.70)
pre_crm_cohort	0.107 (0.48)	0.384 (1.27)	0.079 (0.30)	-0.093 (0.40)
post_crm_cohort	0.110 (0.58)	-0.422+ (1.79)	-0.267 (1.17)	0.079 (0.38)
region==2 (Midwest)	-0.011 (0.07)	-0.108 (0.49)	0.085 (0.44)	0.127 (0.77)
region==3 (South)	-0.203 (1.19)	0.123 (0.57)	0.168 (0.79)	-0.146 (0.82)
region==4 (West)	0.028 (0.16)	0.128 (0.58)	0.055 (0.27)	-0.209 (1.17)
Observations	623	648	580	781

Absolute value of z statistics in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Year dummies and constant are controlled but not reported here.

For the full model, we use equations (32a & b)-(33a & b), which form a system of 4 equations in 6 unknowns (the four policy variables and the two Lagrangean multipliers). Consequently, we can expect to find a 2-manifold of solutions in the full model if there are any solutions. We formed fine grids of the relevant domain $[t_{min}, t_{max}]\times[t_{min}, t_{max}]$ and started the computation by (randomly) choosing a pair of tax rates from a grid corresponding to the lowest possible values of t^D and t^R (with $t^D > t^R = t_{min}$); we solve the four equations for r^D, r^R, x^D, and x^R for the chosen values of t^D and t^R. In the computation we checked whether (1) the root found by the computer satisfies the four first-order conditions, (2) the indifference curves of party factions are indeed tangent to each other for both parties, and (3) x^D and x^R are nonnegative. We gradually increased the values of t^D and t^R and solved the equations (32a & b)-(33a & b) repeatedly, until we covered the relevant domain $[t_{min}, t_{max}]\times[t_{min}, t_{max}]$. Each run with one set of parameter values requires about 300-330 iterations. For the two counterfactual models, the same procedure is applied, but by solving the two equations (32a) and (33a) for x^D and x^R, while checking whether $x^D \geq 0$ and $x^R \geq 0$ hold.

In the calibrations, we use the parameters and density functions estimated in section 4. Because there is one degree of freedom, we varied δ_0 and determined δ_2 and γ by the two estimated equations:

$$\delta_2(E(t^D_{obs}) - E(t^R_{obs})) - \gamma(r^D_{obs} - r^R_{obs}) = \text{regression coefficient on } \rho, \tag{44}$$

and

$$\varphi(t^D_{obs}, t^R_{obs}, r^D_{obs}, r^D_{obs}; \delta_0, \delta_2, \gamma) = \Phi_{obs}. \tag{45}$$

We found that the *admissible* range of δ_0 is not wide. If δ_0 is too small, γ or δ_2 become negative. When δ_0 is too large, equilibria fail to exist. (Recall that we have to find equilibria for all three models.) The admissible range of δ_0 that allows us to obtain the equilibrium for *all* years and for all *three* models is approximately between 0.85 and 1.1. We admit that value of the parameter δ_0 is crucial for our equilibrium computation; unfortunately, we have no way of estimating it. We carry out numerical computations with two parameter values: $\delta_0 = 0.9$ and $\delta_0 = 1$. We discuss the results for $\delta_0 = 1$. The results for $\delta_0 = 0.9$ are reported in Appendix 1 (Table A-5-1).

As predicted by our model, we find many PUNEEPs. In Figure 5-1, we report the equilibrium values of PUNEEPs in 1984-88, the period in which we obtain the largest number of PUNEEPs for the full model, in several different ways. The first cell in Figure 5-1 shows the

equilibrium values of (t, b, r) in a cube to illustrate how PUNEEPs are distributed. The second cell presents the equilibrium values of (t, r) in the two dimensional policy space. In both cells, we use blue dots to denote the equilibrium policy vectors for party R and red dots to denote those for party D. The big blue dot represents the observed policy vector for party R and the big red dot represents the observed policy vector for party D.

Pictures presented in the first and second cells of Figure 5-1 might give an impression that PUNEEPs are scattered, which they are. The equilibrium tax rate proposed by party D, for instance, ranges from 32% to 61% and that for party R ranges from 11% to 56% in the period of 1984-88. But they are not uniformly scattered.

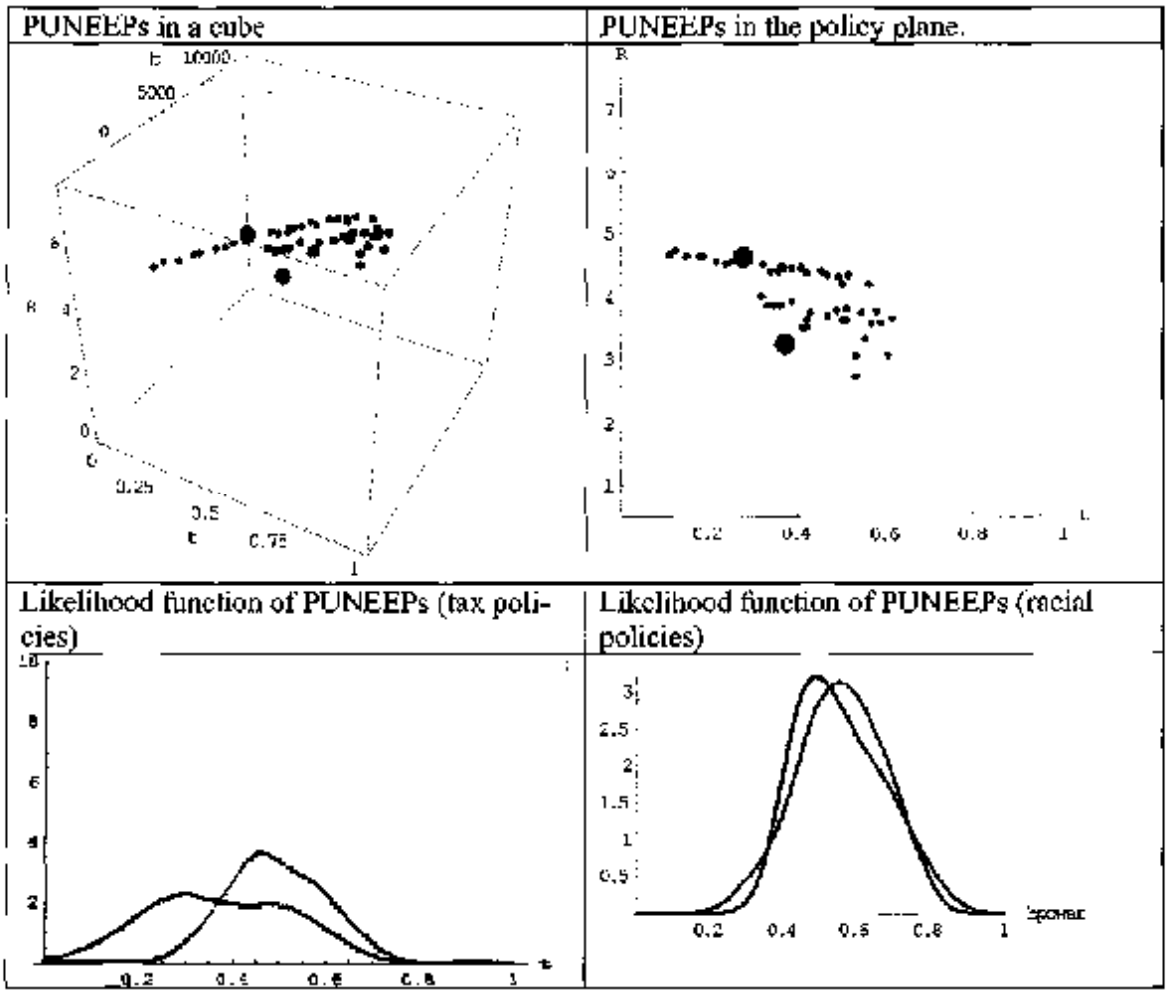
To see whether they appear *equally likely* and what the likelihood of PUNEEPs would be if the same computation were carried out many times, we examined the likelihood functions of PUNEEPs for both parties. The likelihood function of the equilibrium tax rate is presented in the third cell for each party. As one can see from the figure, PUNEEPs are concentrated rather than uniform. The likelihood function of the bargaining power of opportunist faction, presented in the last cell, reveals a clearer picture. This cell clearly shows that the bargaining power is highly concentrated for both parties. The mean values of the relative bargaining power of the Opportunists are approximately 0.5545 for party D and 0.4909 for party R. So in the period of 1984-88, factions have almost identical bargaining powers in both parties.[41]

Because there are many PUNEEPs, we need summary statistics. One way of presenting the PUNEEPs is to take a simple average. This may be problematic in some instances; a few PUNEEPs, at both ends of the distribution, can exercise an unduly large influence in determining the mean value. Thus, because PUNEEPs are concentrated, we take a weighted average, where weights are computed according to the following rule:

(1) For each year, we first compute the likelihood function of the bargaining power in each party and identify its mode (i.e., the value of the bargaining power that is most likely to appear).

[41] But this is not true in general. The bargaining powers vary over years. We find that in party D, the bargaining power of the Opportunists is usually around 0.55. But in the Republican Party, militants are much stronger. The mean bargaining power of the Opportunists in the Republican Party is 0.1940 in 1976-80, 0.2214 in 1980-84, 0.4909 in 1984-88, and 0.0705 in 1988-1992.

Figure 5-1: PUNEEPs' in 1984-1988



Note: Parameter values for these graphs are: $\beta_0 = 1, \beta_2 = 0.1508, \gamma = 0.3559$.

(2) For the i^{th} equilibrium, we then compute its weight for each party, ω_i^J, as follows: $\omega_i^J = W\left(\frac{|\alpha_i^J - \alpha_{mod}^J|}{\max_j |\alpha_j^J - \alpha_{mod}^J|}\right)$, where $W(.)$ is a weight function and α_i^J is the bargaining power of the Opportunist in party J at the i^{th} equilibrium. We chose the popular tri-cube weight function $W(z) \equiv (1 - z^3)^3 \mathbf{I}_{[0,1]}(z)$.[42] Thus if α_i^J is identical to the mode, the platform of party J in the i^{th} equilibrium gets the weight of 1; it is penalized as α_i^J moves away from the mode.

(3) Finally we apply the computed weights to calculate the weighted average of each party's platform vector.

Table 5-1 shows the results obtained by this procedure when $\delta_0 = 1$ for all periods. The expected tax rate is the average of the tax rates of the two parties, weighted by the vote share that each party gets.

First, we remark that the equilibrium prediction in the full model is very close to the observed values; as well, the time series pattern is close to the historical trend reported in Table 4-1. For instance, the expected tax rate at the equilibrium changes from 29.3% in 1976-80 to 34.65% in 1980-1984, and then declines afterwards up to 28.7% in 1988-92. This is remarkable, because we only imposed the specification condition that the vote share predicted by our model at the observed platforms be equal to the observed vote share.

Because the expected tax rate is determined by three factors-- the vote share, the tax rate proposed by party D, and the tax rate proposed by party R--looking only at the expected tax rate may not be enough. So we examined each of these factors separately.

The equilibrium tax rates are differentiated between the two parties. The tax rate proposed by the Democratic Party is usually 12-16% higher than that proposed by the Republican Party. In 1984-88, for instance, the Democratic Party proposes a marginal tax rate of 37% while the Republican Party proposes a tax rate of 23.9%, which is also close to the observed tax rates that we postulated in section 4.

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[42] $\mathbf{I}_{[0,1]}(z)$ is an indicator function which take the value of 1 if z is in the interval [0,1] and 0 otherwise.

Table 5-1: PUNEEPs and the decomposition of racism effect ($\delta_0 = 1$)

1976-80	Full	r=rbar	r=rbar, ρ=ρmin	Total effect	PB	AS	PB (%)	AS (%)
αD (mode)	0.5421							
αR (mode)	0.1840							
tD	0.3473	0.3791	0.4824	0.1351	0.0318	0.1033	23.54%	76.46%
tR	0.2212	0.3432	0.4450	0.2238	0.1220	0.1018	54.51%	45.49%
RD	2.7663							
RR	4.1144							
Exp tax rate	**0.2927**	**0.3698**	**0.4742**	**0.1815**	0.0769	0.1046	42.36%	57.64%
Vote share	0.5168	0.7351	0.7814	0.2648	0.2185	0.0463	82.52%	17.48%
# of PUNEEP	9	45	26					

1980-84	Full	r=rbar	r=rbar, ρ=ρmin	Total effect	PB	AS	PB (%)	AS (%)
αD (mode)	0.5932							
αR (mode)	0.2214							
tD	0.4025	0.4137	0.4666	0.0641	0.0112	0.0529	17.47%	82.53%
tR	0.2129	0.3638	0.4391	0.2262	0.1509	0.0753	66.71%	33.29%
RD	3.4307							
RR	3.7914							
Exp tax rate	**0.3455**	**0.4011**	**0.4567**	**0.1102**	0.0546	0.0557	49.46%	50.52%
Vote share	0.5609	0.7466	0.6417	0.0808	0.1857	-0.1049	229.83%	-129.83%
# of PUNEEP	11	42	19					

1984-88	Full	r=rbar	r=rbar, ρ=ρmin	Total effect	PB	AS	PB (%)	AS (%)
αD (mode)	0.5545							
αR (mode)	0.4909							
tD	0.3709	0.3859	0.4993	0.1284	0.0150	0.1134	11.68%	88.32%
tR	0.2392	0.3234	0.4042	0.1650	0.0842	0.0808	51.03%	48.97%
RD	2.7771							
RR	3.6483							
Exp tax rate	**0.3109**	**0.3659**	**0.4699**	**0.1590**	0.0550	0.1040	34.61%	65.39%
Vote share	0.4049	0.6804	0.7906	0.3857	0.2755	0.1102	71.43%	28.57%
# of PUNEEP	23	52	15					

1988-92	Full	r=rbar	r=rbar, ρ=ρmin	Total effect	PB	AS	PB (%)	AS (%)
αD (mode)	0.5529							
αR (mode)	0.0705							
tD	0.3164	0.3320	0.4409	0.1255	0.0168	0.1089	13.23%	86.77%
tR	0.1504	0.3004	0.4030	0.2526	0.1500	0.1026	59.38%	40.62%
RD	2.8738							
RR	4.1953							
Exp tax rate	**0.2870**	**0.3241**	**0.4270**	**0.1400**	0.0371	0.1028	26.53%	73.47%
Vote share	0.5797	0.7508	0.6320	0.0523	0.1711	-0.1188	327.15%	-227.15%
# of PUNEEP	15	36	11					

The equilibrium vote share of party D is also close to the historical vote share, although its prediction is poor in 1980-84. Our equilibrium prediction is that the vote share for the Democratic Party in that period is greater than 50%, although the Republican Party won that election.

One reason for inaccuracy in some years is because the true value of δ_0, which we are unable to identify, may not be equal to 1 for these years. Nevertheless, we believe that the level of prediction accuracy achieved by a model that controls only two dimensions of American political life is high.

The effect of racism on redistribution in the United States is large. We predict that the Republican Party would have proposed a marginal tax rate of 40% in 1984-88, absent racism. Due to the existence of racism, however, the Republican Party was able to propose a tax rate of 23.9% in this period; thus the effect of racism on the tax rate is about 16.5 % in 1984-1988 for the Republican Party. The effect of racism on the tax rate of the Democratic Party is also large. Absent racism, we predict party D would have proposed a marginal tax rate of 49.9%; due to the existence of racism, it proposed 37%.

The fact that the total effect of racism appears to be large for both parties implies that voter racism pushes both parties in the United States *significantly to the right* on the economic issue. Absent race as an issue in American politics, the fiscal policy in the USA would look quite similar to fiscal policies in Northern Europe.

Although the total effect is large for both parties, the composition of the total effect differs between the two parties; see Table 5-1. In terms of the tax policy, the policy bundle effect is bigger than the anti-solidarity effect for the Republican Party whereas the anti-solidarity effect is bigger for the Democratic Party. In 1980-84, for example, for party D, 82% of the total effect of racism on the tax rate is attributed to the anti-solidarity effect.

The effect of racism on redistribution varies across time, reflecting changes in the distribution of voter traits. In terms of the expected tax rate, the smallest effect is in 1980-1984, where the distribution of racial views among citizens is least skewed and has the lowest mean.

The effect of voter racism on the *vote share* for party D is also very large. The biggest effect occurred in 1984-88 when the Democrats lost about 38% of vote share due to racism. We note that for some years (1980-84 and 1988-92) the anti-solidarity effect of voter racism *on vote share* is *positive* rather than negative. Recall that the vote shares are affected through two channels: the direct channel mediated through changes in parameter values and the indirect channel through changes in equilibrium platforms. Indeed when we compute the vote share while fixing the

platform at the value obtained from the full model, the two effects of voter racism on D vote share is always negative; the indirect effect induced by the platform change has a large influence on the vote share.

Another way of looking at the significance of the policy bundle effect is to examine the equilibrium party membership. (Recall that our model determines party memberships endogenously, together with the equilibrium policy vectors.) In Figure 5-2, we have drawn the party membership separation hyper-space, together with the observed membership distribution of voter types, for three models: the full model and the two counterfactual models.

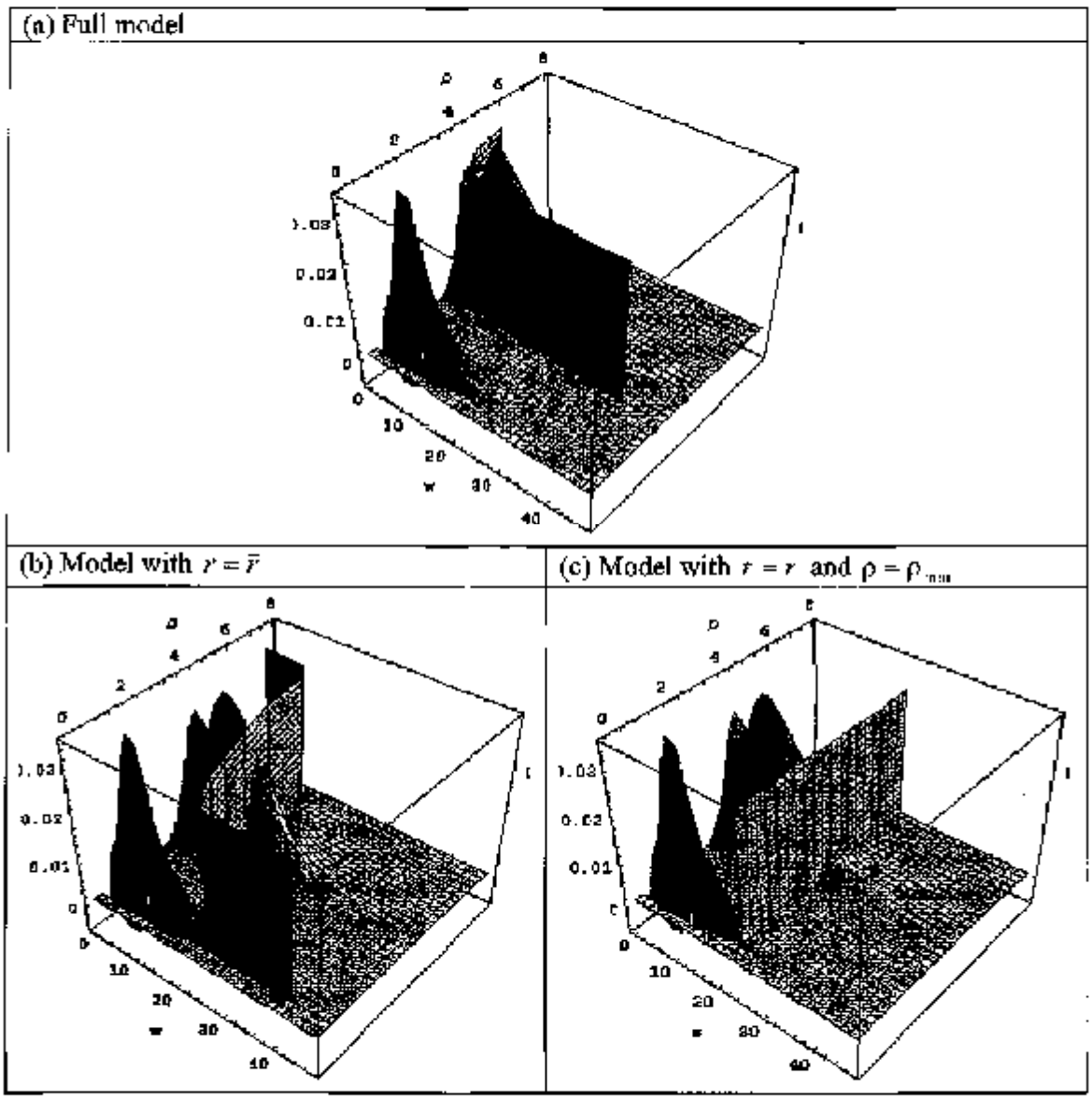
Figure 5-2(a) shows that party membership is more sensitive to voters' racial positions than to their economic positions. The hyper-space that separates the type space into the two parties is negatively sloped in the full model but the slope is small. Figures 5-2(b) and 5-2(c) indicate that, were the race issue not a dimension of political competition, citizens would be partitioned into parties more according to their economic position rather than their racial position.

Alternatively phrased, our model predicts an alignment of political parties in the US primarily along the racial issue, in the sense that party membership is best characterized by a partition of the space of voter types which differentiates citizens according to their racial views, not their incomes. If, somehow, the race issue were to disappear from politics, there would be realignment so that membership would be defined primarily by differentiation of voters along the economic dimension. We take this difference between party identification in the multi- and unidimensional policy problems to be quite significant.

We next compare the equilibrium separation of citizens into the two parties, determined by the model, with the real party identification estimated from the actual data; Figure 5-3 shows the graph.

Each cell in Figure 5-3 represents the type space, with the wage on the abscissa and racial view in the ordinate. In the graph we represent different densities of *observed* D party membership across 25 discrete cells with different shades of gray; the darker the cell is, the higher the ob-

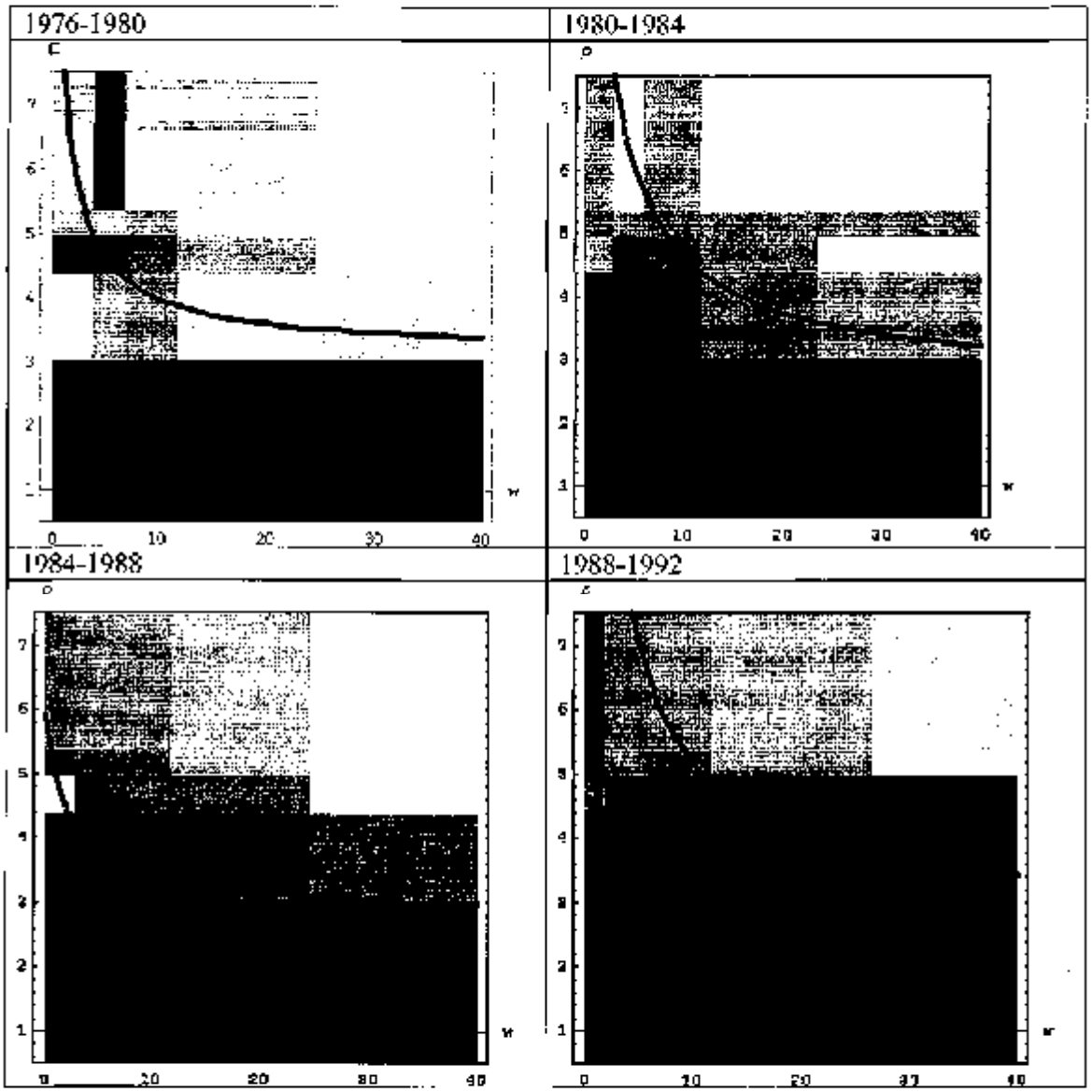
Figure 5-2: Equilibrium Party membership at PUNEEPs: 1984-1988



Note: (1) Voter separation hyperplanes are drawn at the mean value of equilibrium policy vectors.

(2) Parameter values for these graphs are: $\delta_0 = 1, \delta_2 = 0.1508, \gamma = 0.3559$.

Figure 5-3: Equilibrium and observed party membership



Note: (1) Parameter values for these graphs are:

	76-80	80-84	84-88	88-92
δ_0	1	1	1	1
δ_2	0.0640	0.0955	0.1508	0.0787
γ	0.1584	0.2999	0.3559	0.1632

(2) Shades of gray represent the density plot of observed D party membership computed from actual data; the darker the cell is, the higher the observed membership.
(3) The downward sloping curves represent the equilibrium party separation graph in the model.

served Democratic membership. Shown together with the density plots is the party separation graph $\rho = \Psi(\omega, \tau^D, \tau^R)$, the cutoff hyper-space for party membership in the model. Since there are many PUNEEPs, there are as many Ψ graphs as there are PUNEEPs. The graph of Ψ drawn in Figure 5-3 is based on the (weighted) mean value of the platform vector (τ^D, τ^R). If reality conformed perfectly to the model, then each of these graphs would be all black below the curve and all white above the curve. Albeit imperfect, the separation of party membership by the hyper-space is quite close to the actual separation of party membership.

Figure 5-3 shows the historical voter realignment more clearly than Figure 5-2. In 1976-1980 and 1980-84, the model predicts that many poor racist voters should have voted for the Democratic Party. But these voters are shown to defect from the Democrats to the Republicans gradually, and in 1984-88, poor racist voters no longer vote Democratic. In 1988-1992, poor voters again should vote Democratic, but this is not because the slope of the voter separation curve has changed; the slope of the curve is quite similar. Rather it is mainly because the curve itself has shifted up.

6. Conclusion

We conclude that both the policy bundle effect and anti-solidarity effect of racism on fiscal policy are significant and negative in this period. It appears that the total effect of racism is to reduce the marginal tax rate by between 11 and 18 percentage points. In terms of the expected tax rate, the anti-solidarity effect is approximately similar to the policy bundle effect, and both effects operate in the same direction. In other words, voter racism pushes both parties in the United States significantly to the right on economic issues.

Our analysis provides a very different perspective on the importance of the race issue in American politics than that of Poole of Rosenthal (1997), who argue that, although race has sometimes been a significant second issue, it is of only marginal significance. McCarty, Poole, and Rosenthal (2003) go one more step; they argue that the income dimension has become increasingly important. The Poole-Rosenthal-McCarty analysis, as it is not based on an equilibrium model, is unable to postulate counterfactual histories. Indeed Figures 5-2 and 5-3 show how radically the partition of the set of types into two parties would change were race to cease to be an issue. With the race issue present, the D-R party partition is defined very sharply with respect to

racial views, and much less sharply with respect to income class. Thus a unidimensional (economic) model of American politics gravely mischaracterizes the nature of political competition.

Indeed the historical observation that the United States experienced increasing income inequality *and* significant tax cuts since the 1980s raises one puzzle to the well known claim of unidimensional Downsian models, that the equilibrium tax rate is positively correlated with inequality. If the dimension of income had become more and more important in determining the voting pattern, how could one explain that the equilibrium tax rates have been declining in the period of rising inequality?[43] The current paper provides an answer to this question: the existence of a non-economic dimension, such as race, changes the alignment of voters in a significantly different way from that predicted by one dimensional models.

Our analysis also provides a different perspective on the importance of the race issue in American politics than that of Alesina et al. (2001) and other work we cited in our introduction of this paper. These authors attribute the effect of racism largely to what we call the anti-solidarity effect, but we have shown that the policy bundle effect is non-negligible. As we indicated in section 3, running simple regressions with a racism variable as a regressor cannot identify the two separate effects. Attributing the magnitude of the coefficient on the racism variable to the anti-solidarity effect significantly overestimates its importance.

There are many factors not captured in our model that may affect the electoral outcome; our model captures only two dimensions of politics and two dimensions of voter type. Our results nevertheless indicate that the explanatory power of the 2x2 model is high.

The research strategy employed in the current paper might be fruitfully employed for other countries. In Europe, with the exception of the UK, the influx of people of color has, in large part, been a phenomenon of the last forty years, via immigration from Asia, Asia Minor, and Africa. There have recently emerged, in several countries, politically significant movements and parties, which are anti-immigrant and xenophobic: Le Pen in France is the best known, but one must also mention Austria, the Netherlands, Denmark, and Switzerland. Indeed, the phenomenon of ethnocentrism or xenophobia is 'realigning' voters in these countries; many who used to vote Left are now voting for the new Right. In particular, many unskilled white workers, who feel most

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[43] This does not mean that there have been no attempts at explaining the disparity between the theoretical prediction of the Downsian models and the historical observation. Bénabou and Tiróle (2002) show that beliefs in a just world may affect redistribution politics in a significant way. Bénabou and Ok (2001) and Piketty (1996) show how the perception about social mobility can affect the equilibrium outcome. Although there have been some attempts at examining the effect of social mobility and/or beliefs in a just world on political outcomes with cross-country

threatened by immigration, globalization and skill biased technological change, have switched their allegiance. In future work, we will examine how the anti-solidarity effect and the policy bundle effect differ across countries.

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regressions, whether Americans changed their beliefs significantly during the period in a way consistent with the prediction of these models is a question for future research.

Appendix 1: Other tables and figures

Table A-2-1: Voting fractions in the United States (Source: NES)

A. Entire population (Whites and Blacks)

		Fraction voting for				Net change from 1960-1964		
	Period	D	R	Third	Total	D	R	Third
	1960-64	60.48	39.11	0.4	100			
	1968-72	37.24	57.83	4.92	100	-23.24	18.72	4.52
	1980-88	43.78	53.08	3.17	100	-16.7	13.95	2.77
All	1992-96	47.9	37.85	14.26	100	-12.58	-1.26	13.86
	1960-64	57.86	41.7	0.44	100			
	1968-72	32.22	62.51	5.27	100	-25.64	20.81	4.83
	1980-88	38.19	58.4	3.41	100	-19.67	16.7	2.97
Whites	1992-96	42.68	41.6	15.72	100	-15.18	-0.1	15.28
	1960-64	93.06	6.94	0	100			
	1968-72	89.09	10	0.91	100	-3.97	3.06	0.91
	1980-88	91.16	7.18	1.66	100	-1.9	0.24	1.66
Blacks	1992-96	91.72	4.46	3.82	100	-1.34	-2.48	3.82

B. Whites only

		Fraction voting for				Net change from 1960-1964		
	Period	D	R	Third	Total	D	R	Third
	1960-64	61.76	37.83	0.41	100			
	1968-72	33.43	60.39	6.19	100	-28.33	22.56	5.78
Non-rich	1980-88	42.32	54.63	3.05	100	-19.44	16.8	2.64
Whites	1992-96	47.85	38.8	13.34	100	-13.91	0.97	12.93
	1960-64	52.97	46.53	0.5	100			
	1968-72	30.11	65.84	4.04	100	-22.86	19.31	3.54
Rich	1980-88	32.26	64.02	3.72	100	-20.71	17.49	3.22
Whites	1992-96	35.34	44.4	20.26	100	-17.63	-2.13	19.76
	1960-64	59.7	39.8	0.49	100			
	1968-72	32.52	61.7	5.78	100	-27.18	21.9	5.29
Uneducated	1980-88	38.36	58.88	2.76	100	-21.34	19.08	2.27
Whites	1992-96	45.3	37.44	17.26	100	-14.4	-2.36	16.77
	1960-64	42.31	57.69	0	100			
	1968-72	30.92	66.18	2.9	100	-11.39	8.49	2.9
Educated	1980-88	37.62	57.04	5.34	100	-4.69	-0.65	5.34
Whites	1992-96	38.52	48.98	12.5	100	-3.79	-8.71	12.5

Table A-2-2: Varimax-rotated factor loadings: Whites only (Source: NES)

1976 (obs.=497)

Variable	1 feminism	2 compassion	3 libertarianism	4 racism	Uniqueness
Antiblack affect	0.01822	-0.07963	-0.07387	**0.82937**	0.30001
Civil rights push too fast	-0.20691	0.0181	0.19432	**0.69206**	0.44015
Poor thermometer	-0.05059	**0.74197**	0.12747	0.01666	0.43039
Welfare thermometer	0.07812	**0.77161**	-0.08294	-0.19544	0.35343
Union thermometer	0.06135	**0.58147**	-0.40796	0.18032	0.45918
Strong government	0.06319	-0.05828	**0.7398**	0.07416	0.43688
Trust government	0.07357	-0.01298	**-0.70663**	0.00232	0.49509
Women equal	**-0.80756**	0.25927	0.0293	0.08596	0.27238
Women liberty thermometer	**0.81714**	0.24631	0.05921	0.02117	0.25766
Political ideology	-0.54612	-0.19377	0.10397	0.22827	0.60128
Eigenvalues	2.03891	1.59067	1.1905	1.12346	
Difference	0.44824	0.40017	0.06704	0.23372	
Proportion	0.2039	0.1591	0.1191	0.1123	
Cumulative	0.2039	0.363	0.482	0.5944	

1992 (obs.=508)

Variable	1 feminism	2 compassion	3 anti-libertarianism	4 racism	Uniqueness
Antiblack affect	0.03785	-0.06921	0.01671	**0.86212**	0.25024
Civil rights push too fast	-0.37889	0.02574	-0.07252	**0.62184**	0.46384
Poor thermometer	-0.02324	**0.7910**	-0.05156	0.05249	0.36837
Welfare thermometer	0.09675	**0.7356**	-0.02186	-0.31366	0.35067
Union thermometer	0.13894	**0.68017**	0.20075	0.10673	0.46837
Strong government	-0.23476	-0.19503	**-0.67365**	0.04696	0.45084
Trust government	-0.06428	-0.05826	**0.85737**	0.01266	0.25723
Women equal	**-0.80464**	0.08237	0.01048	-0.08149	0.33902
Women liberty thermometer	**0.63397**	0.42618	0.10187	-0.13395	0.38814
Political ideology	-0.71939	-0.13268	-0.03531	0.18314	0.43009
Eigenvalue	2.57095	1.39317	1.21693	1.05412	
Difference	1.17777	0.17624	0.16281	0.30858	
Proportion	0.2571	0.1393	0.1217	0.1054	
Cumulative	0.2571	0.3964	0.5181	0.6235	

Table A-2-3: Multivariate correlation of ideological components with demographic factors

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS
	whites	whites	all	whites	all	whites	all
	racism	liber-tarianism	liber-tarian-ism	compas-sion	compas-sion	feminism	feminism
incomevalue10k	-0.000 (0.85)	-0.000 (0.46)	-0.000 (0.44)	-0.001+ (1.80)	-0.001+ (1.89)	0.001 (1.20)	0.001 (1.13)
education1==1	0.368* (2.36)	-0.023 (0.14)	-0.054 (0.34)	0.033 (0.30)	0.040 (0.40)	-0.022 (0.13)	-0.048 (0.33)
education1==2	0.481** (7.76)	0.081 (1.26)	0.055 (0.89)	0.050 (1.18)	0.045 (1.10)	-0.211** (3.42)	-0.208** (3.49)
education1==3	0.242** (3.86)	0.066 (0.97)	0.062 (0.95)	0.025 (0.56)	0.022 (0.51)	-0.145* (2.34)	-0.145* (2.43)
blackdummy			0.072 (0.83)		-0.059 (0.95)		-0.008 (0.10)
hispanic_origin	-0.256* (2.41)	-0.087 (0.75)	-0.127 (1.15)	0.292** (3.37)	0.275** (3.15)	-0.001 (0.01)	-0.009 (0.08)
femaledummy	-0.053 (1.06)	-0.137** (2.65)	-0.119* (2.41)	0.107** (3.10)	0.090** (2.71)	0.134** (2.68)	0.134** (2.83)
marrieddummy	0.037 (0.69)	0.067 (1.23)	0.044 (0.83)	-0.148** (3.98)	-0.147** (4.13)	-0.257** (4.90)	-0.266** (5.27)
unemployeddummy	-0.324** (3.14)	0.076 (0.68)	0.047 (0.46)	0.292** (3.67)	0.229** (3.11)	0.208* (1.99)	0.155 (1.64)
unionmemdummy	0.120+ (1.90)	-0.161* (2.46)	-0.132* (2.15)	0.175** (4.05)	0.166** (4.04)	0.106+ (1.70)	0.101+ (1.72)
protestantism	0.085** (2.67)	0.028 (0.82)	0.012 (0.36)	-0.141** (6.10)	-0.137** (6.12)	-0.283** (8.01)	-0.283** (8.39)
respondent age	0.009* (2.25)	0.005 (1.16)	0.004 (1.04)	0.002 (0.69)	0.001 (0.52)	-0.006 (1.47)	-0.005 (1.45)
pre_crm_cohort	0.009 (0.08)	-0.037 (0.33)	-0.024 (0.23)	0.062 (0.85)	0.046 (0.66)	0.099 (0.94)	0.064 (0.65)
post_crm_cohort	0.133 (1.54)	-0.035 (0.40)	-0.038 (0.45)	-0.032 (0.53)	-0.057 (0.98)	-0.008 (0.09)	-0.045 (0.53)
urbanism (1=city...3=rural)	0.104** (3.02)	0.027 (0.77)	0.031 (0.93)	-0.027 (1.04)	-0.032 (1.32)	-0.075* (2.05)	-0.077* (2.24)
region==2 (Midwest)	-0.001 (0.01)	-0.118 (1.53)	-0.096 (1.31)	-0.003 (0.06)	0.021 (0.44)	-0.056 (0.77)	0.010 (0.14)
region==3 (South)	0.089 (1.24)	-0.050 (0.65)	-0.053 (0.74)	0.076 (1.45)	0.081 (1.62)	-0.009 (0.13)	0.034 (0.48)
region==4 (West)	-0.145* (2.01)	0.022 (0.30)	0.029 (0.40)	-0.046 (0.88)	-0.021 (0.42)	-0.003 (0.04)	0.054 (0.73)
Observations	1530	1530	1704	1530	1704	1530	1704
R-squared	0.10	0.02	0.02	0.09	0.08	0.10	0.10

Robust t statistics in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Year dummies and constant are controlled but not reported here

Table A-2-4: Full regression results for Table 2-2

	(1) OLS	(2) OLS	(3) OPROB	(4) OPROB	(5) OPROB	(6) OPROB
	7pt govt services/ spending: 1=decrease ... 7=increase	7pt govt health insurance scale 1=pro ... 7=gov	food stamps spending - federal budget 1=increase ... 3=decrease	public schools spending - fed budget 1=increase ... 3=decrease	social security spending - federal budget 1=increase ... 3=decrease	environment spending - federal budget 1=increase ... 3=decrease
racism	-0.205**	0.226**	0.196**	0.067+	0.029	0.159**
	(4.22)	(4.25)	(5.33)	(1.74)	(0.78)	(4.32)
libertarianism	-0.061	0.056	0.024	0.108**	0.030	-0.061+
	(1.56)	(1.14)	(0.71)	(2.92)	(0.85)	(1.67)
compassion	0.234**	-0.326**	-0.375**	-0.083*	-0.111**	-0.056
	(5.16)	(6.22)	(10.16)	(2.20)	(3.01)	(1.48)
feminism	0.338**	-0.376**	-0.236**	-0.264**	-0.126**	-0.279**
	(7.50)	(7.28)	(6.56)	(7.07)	(3.41)	(7.31)
incomevalue10k	-0.001+	0.005**	0.002*	0.001	0.002*	0.000
	(1.72)	(5.52)	(2.30)	(1.03)	(2.56)	(0.59)
educational	0.489	-0.353	0.214	-0.401+	-0.822**	0.333+
	(1.56)	(1.28)	(1.08)	(1.87)	(3.91)	(1.65)
educational==2	0.386**	-0.204+	0.171+	-0.172+	-0.561**	-0.023
	(3.85)	(1.69)	(1.94)	(1.83)	(6.13)	(0.24)
educational==3	-0.025	-0.175	0.263**	0.039	-0.216*	0.036
	(0.26)	(1.41)	(2.86)	(0.40)	(2.32)	(0.37)
upmobile	-0.235*	0.254*	0.158+	0.256**	0.020	0.023
	(2.37)	(2.03)	(1.84)	(2.84)	(0.22)	(0.25)
downmobile	-0.101	-0.039	0.090	0.492*	0.230	0.235
	(0.83)	(0.27)	(0.48)	(2.57)	(1.19)	(1.19)
respondent age	-0.007	-0.012+	-0.005	0.017**	0.002	0.005
	(1.20)	(1.69)	(1.03)	(3.07)	(0.34)	(0.96)
pre_crm_cohort	0.073	0.321	0.109	-0.291+	0.211	-0.345*
	(0.44)	(1.64)	(0.76)	(1.91)	(1.40)	(2.21)
post_crm_cohort	0.176	-0.114	-0.031	-0.050	0.016	-0.153
	(1.24)	(0.71)	(0.09)	(0.39)	(0.13)	(1.19)
femaledummy	0.277**	-0.147	-0.107	-0.166*	-0.328**	0.035
	(3.45)	(1.53)	(1.47)	(2.26)	(4.57)	(0.47)
marrieddummy	0.036	0.158	0.1374	-0.066	-0.074	0.134+
	(0.42)	(1.50)	(1.88)	(0.84)	(0.98)	(1.69)
unemployeddummy	-0.052	-0.213	-0.349**	-0.293+	-0.302+	0.019
	(0.32)	(0.95)	(3.57)	(1.66)	(1.90)	(0.12)
unionmemdummy	0.120	-0.265*	0.026	-0.140	-0.099	-0.210*
	(1.23)	(2.16)	(0.20)	(1.46)	(1.06)	(2.15)
protestantism	-0.170**	0.172**	0.007	0.029	-0.028	0.054
	(3.12)	(2.71)	(0.16)	(0.60)	(0.59)	(1.12)
region==2 (Mid-west)	-0.110	0.504**	0.158	-0.040	0.228*	0.228*
	(1.00)	(3.58)	(1.60)	(0.38)	(2.21)	(2.08)
region==3 (South)	-0.110	0.476**	0.330**	-0.286*	0.120	0.198+
	(0.90)	(3.13)	(3.13)	(2.55)	(1.09)	(1.71)
region==4 (West)	0.006	0.207	0.228*	-0.261*	0.124	0.228*
	(0.05)	(1.41)	(2.16)	(2.33)	(1.14)	(1.96)
Observations	1256	1941	1193	1225	1222	1216
Covered years	84,88,92	76,84,88,92	84,88,92	84,88,92	84,88,92	84,88,92
R-squared	0.19	0.17				

Robust t statistics for OLS and z statistics for OPROB (Ordered Probit) in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Year dummies and constant are controlled but not reported here

Table A-2-4 Continued: Full regression results for Table 2-2

	(7)OLS	(8)OLS	(9)OLS	(10)OPROB	(11)PROBIT	(12)PROBIT
	7pt govt guaranteed jobs scale 1=pro ... 7=con	should worry less about equality 1=agree ... 5=disagree	poor-welfare-union therm 0-100	does govt waste tax money 1=a lot ... 3=not much	will people take advantage of someone 0=no ... 1=yes	are people helpful 0=no ... 1=yes
racism	0.160** (3.67)	-0.310** (7.64)	-0.627** (4.97)	-0.029 (0.89)	0.273** (4.03)	-0.266** (5.81)
libertarianism	0.200** (5.57)	-0.086* (2.29)	-1.499** (13.90)	-0.346** (11.26)	0.179** (2.71)	-0.174** (3.86)
compassion	-0.310** (7.65)	0.200** (5.23)	10.160** (104.77)	0.068* (2.10)	0.015 (0.21)	0.010 (0.35)
feminism	-0.378** (7.72)	0.364** (9.59)	2.560** (17.55)	0.064* (1.99)	-0.087 (1.29)	0.079+ (1.72)
incomevalue10k	0.003** (4.71)	-0.000 (0.08)	-0.004+ (1.91)	-0.001+ (1.94)	-0.001 (0.41)	-0.001 (1.22)
Ieducation1	-0.173 (0.79)	-0.781** (3.19)	1.639** (2.66)	0.243 (1.53)	0.698* (2.45)	-0.573** (2.70)
education1==2	-0.112 (1.26)	-0.441** (4.70)	0.362 (1.28)	-0.109 (1.37)	0.450* (2.32)	-0.329** (2.85)
education1==3	0.126 (1.41)	-0.229* (2.39)	-0.371 (1.32)	-0.216* (2.56)	0.397* (2.00)	-0.178 (1.47)
upmobile	0.205* (2.21)	-0.088 (0.97)	-0.227 (0.79)	0.039 (0.50)	-0.247 (1.40)	-0.010 (0.09)
downmobile	-0.025 (0.15)	0.482* (2.16)	0.105 (0.26)	-0.258 (1.63)	0.236 (0.90)	-0.371* (2.01)
respondent age	0.006 (1.14)	-0.004 (0.82)	-0.009 (0.57)	-0.008+ (1.90)	-0.008 (0.90)	0.006 (1.05)
pre_crm_cohort	-0.196 (1.27)	0.020 (0.13)	0.651 (1.46)	0.121 (0.94)	0.061 (0.22)	-0.019 (0.11)
post crm_cohort	-0.131 (1.07)	0.155 (1.22)	0.477 (1.34)	0.109 (1.04)	0.091 (0.43)	-0.147 (1.01)
femaledummy	-0.177* (2.43)	-0.020 (0.28)	0.231 (1.09)	0.036 (0.57)	-0.201 (1.54)	0.134 (1.53)
marrieddummy	0.045 (0.57)	-0.075 (0.94)	0.093 (0.41)	0.019 (0.28)	-0.086 (0.58)	0.305** (3.23)
unemployeddummy	-0.491** (2.92)	-0.350* (2.01)	-0.172 (0.41)	-0.075 (0.54)	0.721* (2.51)	-0.432* (2.51)
unionmemdummy	-0.294** (3.09)	0.017 (0.18)	1.861** (7.39)	-0.222** (2.80)	0.076 (0.49)	-0.154 (1.39)
protestantism	0.055 (1.14)	-0.067 (1.38)	-0.067 (0.47)	0.055 (1.33)	-0.020 (0.22)	0.093 (1.57)
region==2 (Mid-west)	0.118 (1.11)	-0.063 (0.62)	0.272 (0.91)	-0.227** (2.60)	0.175 (0.97)	-0.207+ (1.67)
region==3 (South)	-0.083 (0.76)	-0.224* (2.04)	0.068 (0.22)	-0.246** (2.71)	0.274 (1.39)	-0.301* (2.27)
region==4 (West)	-0.040 (0.36)	0.059 (0.52)	0.020 (0.06)	-0.295** (3.15)	0.091 (0.45)	-0.166 (1.23)
Observations	1863	1232	2010	2005	763	1000
Covered years	all	94,88,92	all	all	76	76,92
R-squared	0.16	0.22	0.90			

Robust t statistics for OLS and z statistics for OPROB (Ordered Probit) in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Year dummies and constant are controlled but not reported here

Table A-2-4 Continued: Full regression results for Table 2-2

	(13)OLS	(14)OLS	(15)OLS	(16)OPROB	(17)OLS
	7pt defense spending scale 1=decrease ... 7=increase	7pt urban unrest scale 1=solve by helping poor ... 7=solve by force	authority of the bible 1=agree ... 4=disagree	schoolprayer 1=agree ... 3=disagree	when should abortion be allowed by law 1=never ... 4=always
racism	0.325** (7.82)	0.447** (7.31)	-0.099** (4.65)	-0.166** (2.93)	-0.081** (2.93)
liberlarienism	-0.031 (0.83)	0.100+ (1.78)	0.032 (1.60)	-0.061 (1.10)	0.018 (0.72)
compassion	-0.003 (0.06)	-0.263** (4.11)	-0.052* (2.52)	0.010 (0.18)	-0.108** (3.93)
feminism	-0.223** (5.45)	-0.333** (5.15)	0.075** (3.60)	0.268** (4.44)	0.277** (10.83)
incomevalue10k	0.002* (2.48)	0.002 (1.47)	0.001** (2.71)	0.001 (1.00)	0.002** (3.57)
Ieducation1	0.469+ (1.90)	0.601+ (1.85)	-0.426** (3.19)	-0.448 (1.51)	-0.387* (2.57)
education1==2	0.319** (3.54)	0.271+ (1.85)	-0.268** (5.31)	-0.507** (3.50)	-0.259** (4.03)
education1==3	0.347** (3.96)	0.206 (1.51)	-0.198** (3.97)	-0.227 (1.59)	-0.074 (1.17)
upmobile	0.250** (2.78)	-0.009 (0.06)	0.008 (0.18)	-0.193 (1.41)	-0.140* (2.21)
downmobile	0.080 (0.49)	0.118 (0.47)	0.009 (0.10)	-0.086 (0.41)	-0.046 (0.44)
respondent age	-0.004 (0.75)	-0.006 (0.69)	0.004 (1.31)	0.003 (0.39)	-0.005 (1.25)
pre crm cohort	0.148 (1.03)	0.283 (1.15)	-0.018 (0.22)	0.115 (0.49)	0.258* (2.52)
post_crm_cohort	-0.054 (0.43)	-0.329+ (1.74)	-0.027 (0.43)	0.519** (2.84)	0.063 (0.73)
fenaledummy	-0.151* (2.06)	-0.552** (4.81)	-0.026 (0.65)	-0.202* (1.82)	-0.012 (0.24)
marrieddummy	0.113 (1.46)	0.081 (0.65)	-0.059 (1.33)	-0.099 (0.82)	-0.148** (2.78)
unemployeddummy	0.354+ (1.91)	0.151 (0.73)	0.203+ (1.79)	0.141 (0.59)	0.103 (0.96)
unionmemdummy	-0.125 (1.37)	0.143 (1.01)	0.057 (1.24)	0.141 (2.05)	0.080 (1.31)
protestantism	-0.002 (0.05)	0.104 (1.36)	-0.217** (8.59)	-0.165* (2.22)	-0.128** (3.76)
region==2 (Mid-west)	-0.019 (0.18)	0.023 (0.14)	-0.127* (2.21)	0.193 (1.18)	-0.189* (2.55)
region==3 (South)	0.314** (2.93)	0.325+ (1.84)	-0.138* (2.48)	-0.082 (0.52)	-0.079 (1.06)
region==4 (West)	-0.111 (1.06)	0.037 (0.21)	-0.042 (0.70)	0.557** (3.49)	0.063 (0.86)
Observations	1473	916	951	543	1511
Covered years	80,84,88,92	76,92	80,84,88	80,84	80,84,88,92
R-squared	0.26	0.20	0.23		0.20

Robust t statistics for OLS and z statistics for OPROB (Ordered Probit) in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Year dummies and constant are controlled but not reported here

Table A-4-1: CPI indices and OASDI tax rate table used in the paper

			OASDI and HI tax rate table				
			OASDI			HI	
	CPI	multiplier	employees	self-employed	taxable maximum	employees	self-employed
1971	40.5	2.565432	0.0460	0.0690	$7,800	0.0060	0.0060
1972	41.8	2.485646	0.0460	0.0690	$9,000	0.0060	0.0060
1975	53.8	1.931227	0.0495	0.0700	$14,100	0.0090	0.0090
1976	56.9	1.826011	0.0496	0.0700	$15,300	0.0090	0.0090
1979	72.6	1.431129	0.0508	0.0705	$22,900	0.0105	0.0105
1980	82.4	1.260922	0.0508	0.0705	$25,900	0.0105	0.0105
1983	99.6	1.043173	0.0540	0.0805	$35,700	0.0130	0.0130
1984	103.9	1	0.0570	0.1140	$37,800	0.0130	0.0260
1987	113.6	0.914613	0.0570	0.1140	$43,800	0.0145	0.0290
1988	118.3	0.878276	0.0606	0.1212	$45,000	0.0145	0.0290
1990	130.7	0.79495	0.0620	0.1240	$51,300	0.0145	0.0290

Source: (1) CPI indices are taken from Table B-60 in the *Economic Report of the President* (2001).

(2) OASDI and HI tax rates are taken from the tax rate table posted in the official web site of the Social Security Administration (URL: http://www.ssa.gov/OACT/COLA).

Table A-4-2: Comparison of percentile incomes (nominal) in the NES and the PSID

Year		16 pctile	33 pctile	67 pctile	95 pctile	97 pctile
1976	W-NES	3999	7999	14999	34999	
	W-PSID (3077)	3500	8500	17800	36530	
	w-PSID (2473)	2.28	4.10	7.09	13.78	37.54
1980	W-NES	6899	11899	24999	49999	
	W-PSID (3268)	5296	11828	25230	53000	
	w-PSID (2662)	3.23	5.60	10.20	19.30	53.63
1984	W-NES	6998	12999	29999	59999	
	W-PSID (3405)	7763	15500	33500	71000	
	w-PSID (2704)	3.39	6.65	12.50	24.50	64.35
1988	W-NES	9999	14999	34999	89999	
	W-PSID (3479)	8385	19000	41146	90768	
	w-PSID (2781)	3.92	7.35	14.70	31.28	96.53
1992	W-NES	9999	19999	39999	89999	
	W-PSID (3518)	8000	19685	45000	99010	
	w-PSID (2790)	3.87	7.83	15.31	33.26	96.53

Note: The statistics in 1992 for the PSID is based on 1990 data (using the 1991 PSID).

Table A-4-3: Estimated parameter values of the model (Summary)

	1976	1980	1984	1988	1992	Source
cpi multiplier (1984==1)	1.826	1.2609	1	0.8783	0.7949	ERP
w_M: male hourly wage (nominal $)	6.18	8.65	10.75	12.79	13.46	PSID
w_F: female hourly wage (nominal $)	2.72	3.95	5.26	6.78	7.77	PSID
L_M: male annual working hours	1951.2	1919.8	1925.7	1973.6	1974.5	PSID
L_F: female annual working hours	850.3	966.0	1101.0	1176.9	1208.1	PSID
Y_M: male labor income (nominal $)	12790.2	17790.8	23049.4	27769.6	30099.3	PSID
Y_F: female labor income (nominal $)	3563.7	5542.5	8160.6	11009.1	12703.3	PSID
O: Other family income (nominal $)	1504.3	2124.0	3557.8	4381.5	4331.9	PSID
W: Pre-fisc family income (nominal $)	14978.0	21217.7	29085.3	36310.3	39320.5	PSID
X: Post-fisc family income (nominal $)	13361.7	11357.3	25574.0	32385.9	35000.9	PSID
Gini: Pre-fisc family income (nominal)	0.4211	0.4206	0.4351	0.4489	0.4627	PSID
Gini: Post-fisc family income (nominal)	0.3273	0.3237	0.3471	0.3633	0.3734	PSID
Theil: Pre-fisc family income (nominal)	0.3097	0.3034	0.3435	0.3654	0.3878	PSID
Theil: Post-fisc family income (nominal)	0.1792	0.1734	0.2155	0.2401	0.2534	PSID
$k_1=w_F/w_M$	0.4397	0.4562	0.4889	0.5301	0.5772	PSID
k_3=O/W	0.1004	0.1001	0.1223	0.1207	0.1238	PSID
uncompensated elasticity (male)	0.03		0.05			HT
uncompensated elasticity (female)	0.99		0.97			HT
t_{obs}: observed tax rate	0.3496	0.3722	0.3204	0.2808	0.2793	PSID
b_{obs}: observed per capita transfer (real $)	6609.9	6555.0	5807.7	5509.8	5295.6	PSID
C: per capita public good (nominal $)	1616.3	2697.8	3511.3	3924.4	4319.6	PSID
tD_{obs}	0.3496	0.3496	0.3496	0.3496	0.3496	PSID
tR_{obs}	0.2793	0.2793	0.2793	0.2793	0.2793	PSID
bD_{obs} (real $)	6609.9	6609.9	6609.9	6609.9	6609.9	PSID
bR_{obs} (real $)	5295.6	5295.6	5295.6	5295.6	5295.6	PSID
RD_{obs}	3.1751	3.1322	3.1883	3.3604	3.3087	NES
RR_{obs}	3.9209	4.9712	4.5281	4.7850	4.9128	NES
white population ratio	0.880	0.879	0.877	0.874	0.870	SAUS
observed D vote share	0.511	0.447	0.408	0.461	0.535	SAUS
self-reported D vote share	0.49	0.43	0.43	0.49	0.57	NES
observed R vote share	0.489	0.553	0.592	0.539	0.465	SAUS

Note: (1) PSID= Panel Study of Income Dynamics; NES=National Election Studies; ERP=Economic Report of the President; SAUS= Statistical Abstracts of the United States; HT= Hausman (1981) and Triest(1990)

(2) Parameter values for 1992 estimated from the PSID are based on the 1991 PSID.

Table A-4-4: Kolmogorov-Smirnov statistic and p-value for evaluating similarities of $g(p \mid w)$ across 5 income groups in the NES

1976-1980				
	2	3	4	5
1	0.1175	0.1669	0.1798	0.1498
	0.649	0.115	0.076	0.426
2		0.1186	0.1396	0.1562
		0.235	0.107	0.236
3			0.0633	0.0674
			0.662	0.882
4				0.1005
				0.597
1980-1984				
	2	3	4	5
1	0.1196	0.0864	0.1396	0.1718
	0.747	0.855	0.317	0.439
2		0.0971	0.0793	0.1436
		0.748	0.931	0.672
3			0.0826	0.1475
			0.549	0.469
4				0.1876
				0.186
1984-1988				
	2	3	4	5
1	0.1163	0.1338	0.1042	0.1631
	0.687	0.244	0.554	0.573
2		0.0614	0.1184	0.2158
		0.981	0.396	0.236
3			0.1177	0.2308
			0.061	0.089
4				0.1305
				0.705
1988-1992				
	2	3	4	5
1	0.1882	0.1155	0.0882	0.2012
	0.638	0.226	0.541	0.084
2		0.0993	0.1861	0.2743
		0.343	0.004	0.004
3			0.1258	0.2141
			0.006	0.016
4				0.1389
				0.256

Note: The numbers in the first cell are Kolmogorov-Smirnov statistic whereas the numbers in the second cell are p-values.

Table A-4-5: R vote share weighted probit regression; the variable past-economy is not controlled

	(1)76-80	(2)80-84	(3)84-88	(4)88-92
racism_induced_aidtoblacks	0.193+ (1.94)	0.702** (4.11)	0.770** (5.83)	0.590** (6.23)
libertarianism	0.144* (2.42)	0.113 (1.58)	-0.186** (2.87)	-0.055 (1.02)
compassion	-0.300** (4.88)	-0.265** (3.62)	-0.143* (2.11)	-0.273** (4.52)
feminism	-0.234** (3.77)	-0.222** (2.86)	-0.455** (6.76)	-0.686** (10.35)
logrealwage	0.104 (1.25)	0.228* (2.36)	0.289** (3.43)	0.149* (2.03)
education1=1	-0.796** (2.98)	-0.009 (0.02)	-0.147 (0.42)	-0.512 (1.53)
education1==2	-0.399* (2.53)	0.118 (0.62)	-0.050 (0.30)	-0.314* (2.17)
education1==3	-0.236 (1.47)	0.149 (0.81)	0.289+ (1.78)	0.114 (0.79)
upmobile	0.076 (0.48)	0.349+ (1.86)	0.445** (2.86)	0.328* (2.21)
downmobile	0.132 (0.66)	0.368 (1.35)	-0.784 (1.55)	-0.156 (0.53)
blackdummy	-1.297** (2.67)	0.340 (0.50)	1.016+ (2.15)	0.581 (1.34)
femaledummy	-0.054 (0.46)	-0.032 (0.22)	-0.022 (0.17)	-0.075 (0.67)
marrieddummy	0.202 (1.48)	0.092 (0.56)	0.002 (0.01)	0.153 (1.24)
unemployeddummy	0.178 (0.62)	0.046 (0.13)	-0.314 (0.87)	-0.384 (1.36)
unionmemdummy	-0.352** (2.59)	-0.642** (3.81)	-0.588** (3.79)	-0.162 (1.15)
protestantism	0.096 (1.23)	0.128 (1.35)	0.147+ (1.79)	0.223** (2.99)
respondent age	-0.002 (0.21)	-0.028** (2.60)	-0.009 (0.90)	0.006 (0.72)
pre_crm_cohort	0.107 (0.48)	0.498+ (1.66)	0.114 (0.45)	-0.089 (0.39)
post_crm_cohort	0.110 (0.58)	-0.466* (2.00)	-0.313 (1.42)	0.109 (0.54)
region==2 (Midwest)	-0.011 (0.07)	-0.125 (0.58)	0.076 (0.40)	0.125 (0.78)
region==3 (South)	-0.203 (1.19)	0.067 (0.32)	0.099 (0.48)	-0.131 (0.75)
region==4 (West)	0.028 (0.16)	0.113 (0.57)	0.047 (0.24)	-0.210 (1.20)
Observations	623	450	585	785

Absolute values of z statistics in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Year dummies and constant are controlled but not reported here

Table A-5-1: PUNEEPs and the decomposition of racism effect ($\delta_0 = 0.9$)

1976-80	Full	r=rbar	r=rbar, ρ=ρmin	Total effect	PB	AS	PB (%)	AS (%)
bpower of D (mode)	0.6042							
bpower of R (mode)	0.2493							
tD	0.3371	0.3619	0.4716	0.1345	0.0248	0.1097	18.44%	81.56%
tR	0.2027	0.3321	0.4157	0.2130	0.1294	0.0836	60.75%	39.25%
RD	3.2162							
RR	4.2044							
Exp tax rate	**0.2872**	**0.3537**	**0.4605**	**0.1733**	0.0665	0.1068	38.37%	**61.63%**
Vote share	0.4966	0.7251	0.8017	0.3051	0.2285	0.0766	74.89%	25.11%
# of PUNEEP	6	30	15					

1980-84	Full	r=rbar	r=rbar, ρ=ρmin	Total effect	PB	AS	PB (%)	AS (%)
bpower of D (mode)	0.5026							
bpower of R (mode)	0.2742							
tD	0.3985	0.4072	0.4433	0.0448	0.0087	0.0361	19.42%	80.58%
tR	0.2094	0.3638	0.4109	0.2015	0.1544	0.0471	76.69%	23.37%
RD	3.1437							
RR	3.8426							
Exp tax rate	**0.3301**	**0.3820**	**0.4336**	**0.1035**	0.0619	0.0417	59.75%	40.25%
Vote share	0.5204	0.6487	0.7013	0.1809	0.1283	0.0526	70.92%	29.08%
# of PUNEEP	13	43	18					

1984-88	Full	r=rbar	r=rbar, ρ=ρmin	Total effect	PB	AS	PB (%)	AS (%)
bpower of D (mode)	0.4993							
bpower of R (mode)	0.3204							
tD	0.3573	0.3801	0.4731	0.1158	0.0228	0.0930	19.69%	80.31%
tR	0.2309	0.2842	0.3824	0.1515	0.0533	0.0982	35.18%	64.82%
RD	2.9184							
RR	3.8346							
Exp tax rate	**0.3072**	**0.3504**	**0.4550**	**0.1478**	0.0432	0.1046	29.23%	70.77%
Vote share	0.4496	0.6903	0.8002	0.3506	0.2407	0.1099	68.65%	31.35%
# of PUNEEP	18	48	13					

1988-92	Full	r=rbar	r=rbar, ρ=ρmin	Total effect	PB	AS	PB (%)	AS (%)
bpower of D (mode)	0.6393							
bpower of R (mode)	0.1759							
tD	0.3044	0.3237	0.4087	0.1053	0.0193	0.0860	18.33%	81.67%
tR	0.1642	0.2987	0.3999	0.2357	0.1345	0.1012	57.06%	42.94%
RD	2.9781							
RR	4.0335							
Exp tax rate	**0.2642**	**0.3162**	**0.4067**	**0.1425**	0.0520	0.0905	36.52%	63.48%
Vote share	0.5476	0.7012	0.6924	0.1448	0.1536	-0.0088	106.06%	-6.06%
# of PUNEEP	12	30	13					

Figure A-2-1: Voter realignment since 1952 (Source: NES)

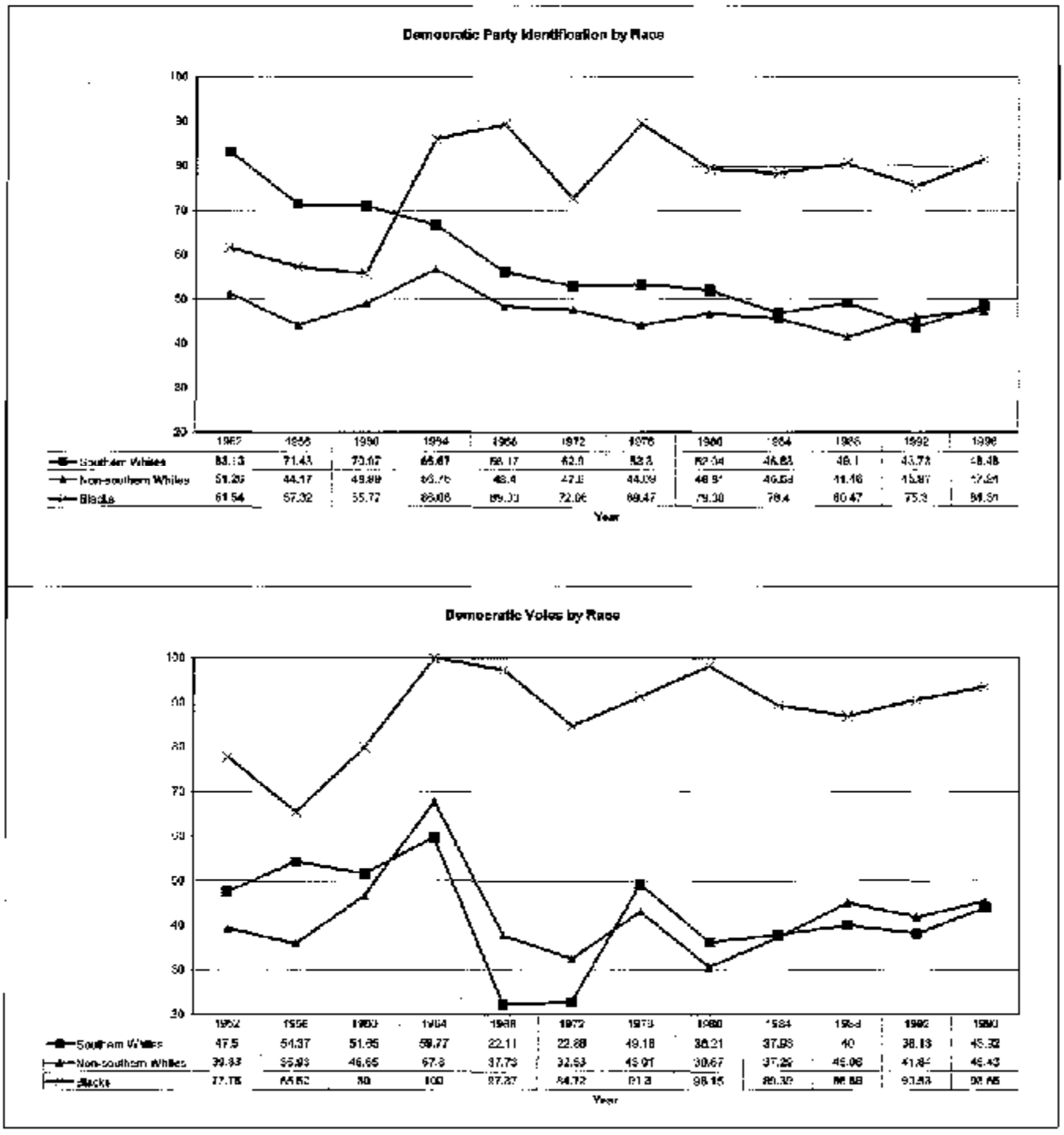


Figure A-4-2: Racism-induced aid-to-blacks across income levels: Whites only (Source: NES)

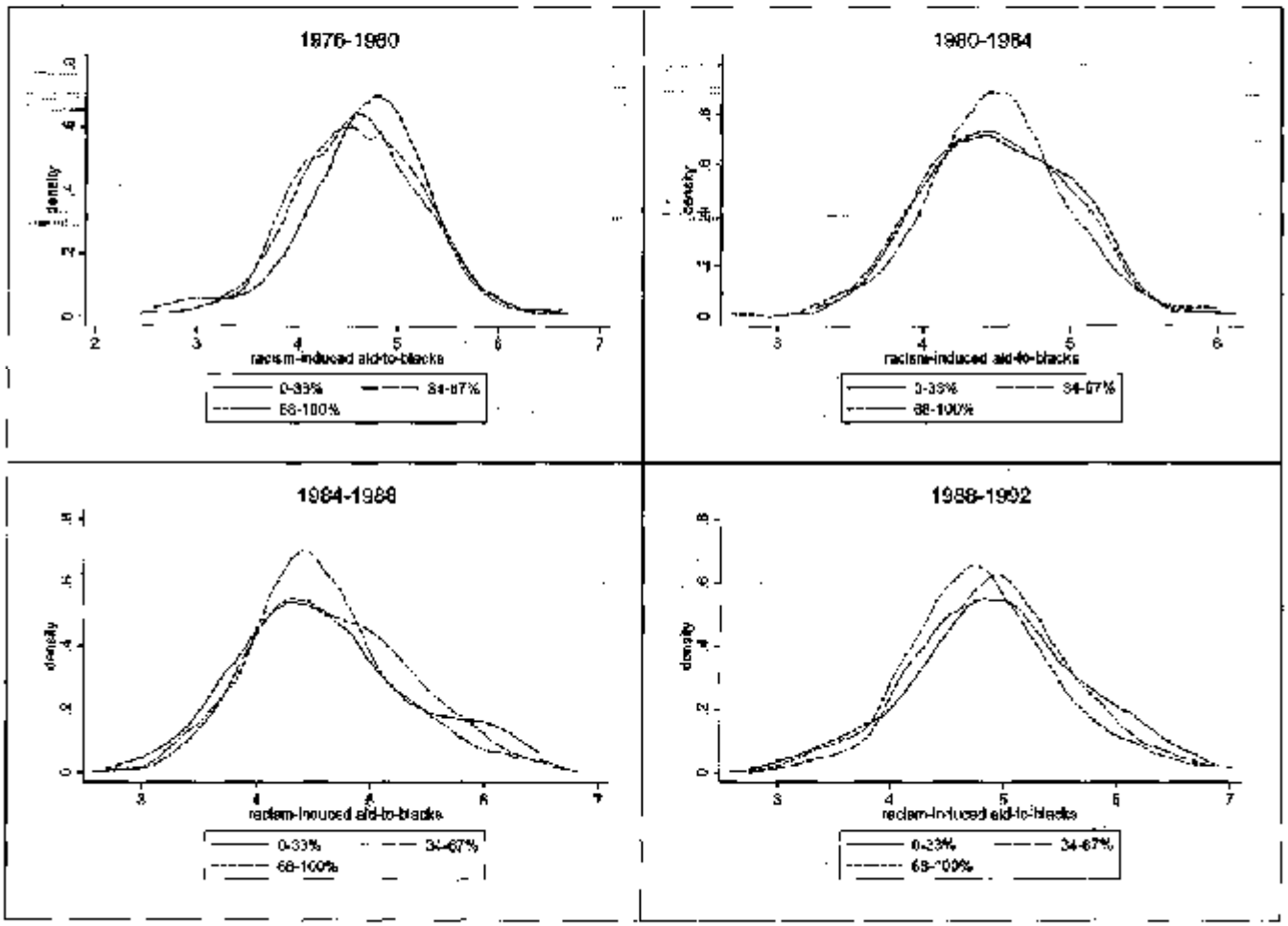
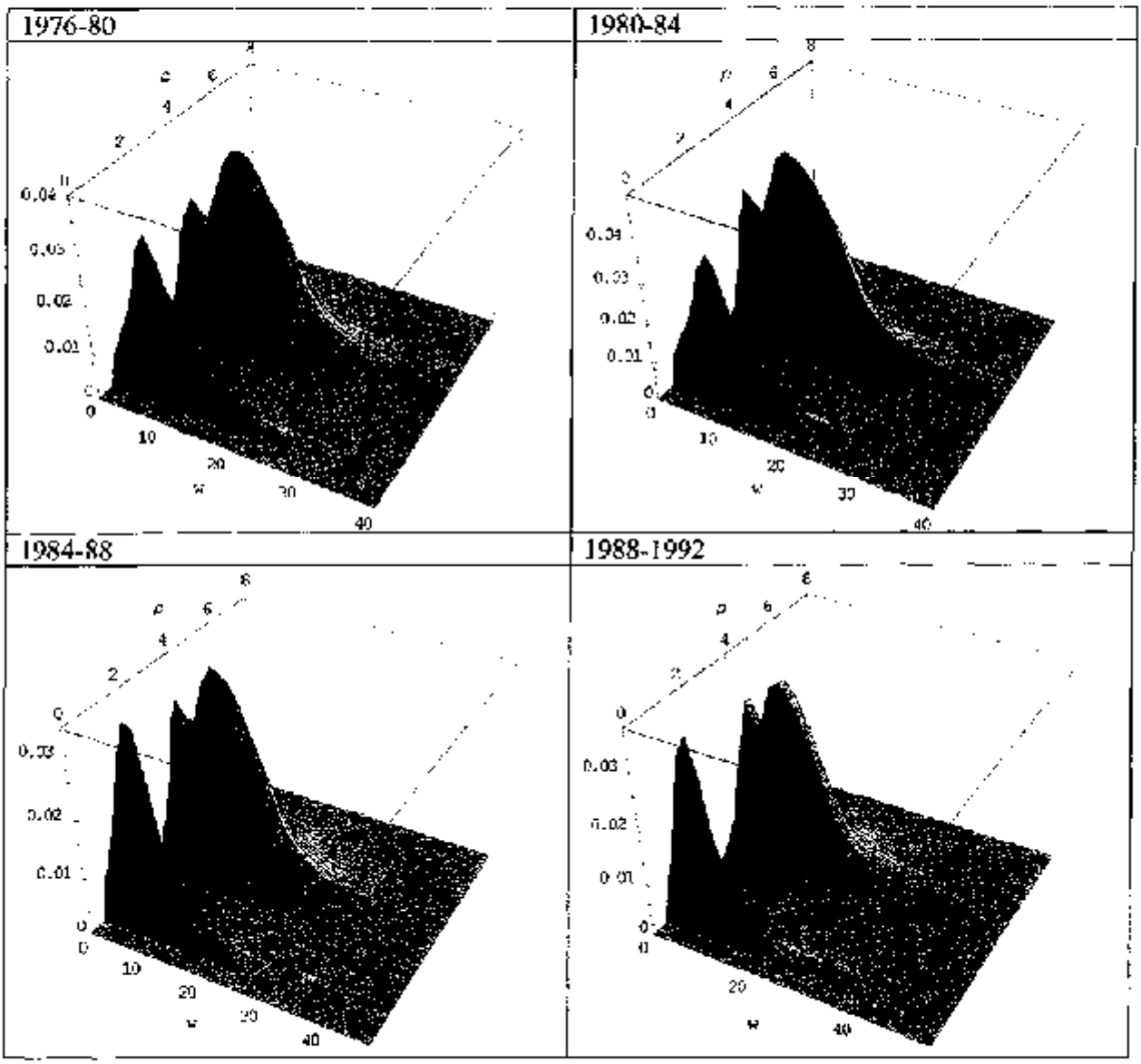


Figure A-4-3: Joint density of voter types (Source: NES and PSID)



Note: We have drawn the joint densities for blacks and whites separately.

Appendix 2: Variables from the National Election Studies

Variable Name	Definition and Coding
Abortion law	There has been some discussion about abortion during recent years. Which one of the opinions on this page best agrees with your view? 1. By law, abortion should never be permitted. 2. The law should permit abortion only in case of rape, incest, or when the woman's life is in danger. 3. The law should permit abortion for reasons other than rape, incest, or danger to the woman's life, but only after the need for the abortion has been clearly established. 4. By law, a woman should always be able to obtain an abortion as a matter of personal choice.
Aid to blacks	Some people feel that the government in Washington should make every possible effort to improve the social and economic position of blacks (1970: Negroes) and other minority groups. Others feel that the government should not make any special effort to help minorities because they should help themselves. 1.Government should help minority groups/blacks 2…6 7. Minority groups/blacks should help themselves
Bible authority	Here are four statements about the Bible and I'd like you to tell me which is closest to your own view. 1. The Bible is God's word and all it says is true 2. The Bible was written by men inspired by God but it contains some human errors. 3. The Bible is a good book because it was written by wise men, but God had nothing to do with it. 4. The Bible was written by men who lived so long ago that it is worth very little today.
Black deserve	Over the past few years blacks have gotten less than they deserve. 1. agree strongly; 2. agree somewhat; 3. neither agree nor disagree; 4. disagree somewhat; 5. disagree strongly
Black difficult	Generations of slavery and discrimination have created conditions that make it difficult for blacks to work their way out of the lower class. 1. agree strongly; 2. agree somewhat; 3. neither agree nor disagree; 4. disagree somewhat; 5. disagree strongly
Black effort	It's really a matter of some people not trying hard enough; if blacks would only try harder they could be just as well off as whites. 1. agree strongly; 2. agree somewhat; 3. neither agree nor disagree, 4. disagree somewhat; 5. disagree strongly
Black favor	Irish, Italians, Jewish and many other minorities overcame prejudice and worked their way up. Blacks should to the same without any special favors. 1. agree strongly; 2. agree somewhat; 3. neither agree nor disagree; 4. disagree somewhat, 5. disagree strongly
Civil rights too fast	Some say that the civil rights people have been trying to push too fast. Others feel they haven't pushed fast enough. 1. Too slowly; 2. About right; 3. Too fast
Feeling (affect) thermometer ratings	We would like to get your feelings towards some of these groups (Blacks, Whites, Poor People, Women's Liberation, Labor Union)… We call it a "feeling thermometer" because it measures your feelings towards groups. . . If you don't know too much about a group or don't feel particularly warm or cold toward them, then you should place them in the middle, at the 50 degree mark. If you have a warm feeling toward a group or feel favorably toward it, you would give it a score somewhere between 50 degrees and 100 degrees, depending on how warm your feeling is toward the group. On the other hand, if you don't feel very favorably toward some of these groups —if there are some you don't care for too much—then you would place them somewhere between 0 degrees and 50 degrees.
Govt spending	Some people think the government should provide fewer services, even in areas such as health and education, in order to reduce spending. Other people feel that it is important for the government to provide many more services even if it means an increase in spending. Where would you place yourself on this scale, or haven't you thought much about this?

	1. Government should provide many fewer services; reduce spending a lot 2...6 7. Government should provide many more services; increase spending a lot
Govt defense spending	Some people believe that we should spend much less money for defense. Others feel that defense spending should be greatly increased. Where would you place yourself on this scale or haven't you thought much about this? 1. Greatly decrease defense spending 2...6 7. Greatly increase defense spending.
Govt environmental spending	Should federal spending on <item> be increased, decreased or kept about the same? 1. increased; 2. same; 3. decreased or cut out entirely
Govt food stamp spending	Should federal spending on <item> be increased, decreased or kept about the same? 1. increased; 2. same; 3. decreased or cut out entirely
Govt health insurance	There is much concern about the rapid rise in medical and hospital costs. Some feel there should be a government insurance plan which would cover all medical and hospital expenses. Others feel that medical expenses should be paid by individuals, and through private insurance. Where would you place yourself on this scale, or haven't you thought much about this? 1. Government insurance plan 2...6 7. Private insurance plan
Govt public school spending	Should federal spending on <item> be increased, decreased or kept about the same? 1. increased; 2. same; 3. decreased or cut out entirely
Govt social security spending	Should federal spending on <item> be increased, decreased or kept about the same? 1. increased; 2. same; 3. decreased or cut out entirely
Helpful	Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves? 1. Just look out for themselves; 2. Try to be helpful
Job guarantee	Some people feel that the government in Washington should see to it that every person has a job and a good standard of living. Others think the government should just let each person get ahead on his/their own. And, of course, some other people have opinions somewhere in between. Where would you place yourself on this scale, or haven't you thought much about this? 1. Government see to job and good standard of living 2...6 7. Government let each person get ahead on his own
Less equality	The country would be better off if we worried less about how equal people are. 1. agree strongly; 2. agree somewhat; 3. neither agree nor disagree; 4. disagree somewhat; 5. disagree strongly
Party of Presidential vote	Who did you vote for President? 1. Democrat; 2. Republican; 3. Major third party candidate
Political ideology: Liberal-conservative scale	We hear a lot of talk these days about liberals and conservatives. Here is a 7-point scale on which the political views that people might hold are arranged from extremely liberal to extremely conservative. Where would you place yourself on this scale? 1. Extremely liberal; 2. Liberal; 3. Slightly liberal; 4. Moderate 5. Slightly conservative; 6. Conservative; 7. Extremely conservative
Political party affect	This is the number of Democratic (Republican) party 'likes' minus the number of Democratic (Republican) party 'dislikes' (VCF0014-VCF0315). -5 Maximum negative .... +5 Maximum positive
School prayer	Some people think it is all right for the public schools to start each day with a prayer. Others feel that religion does not belong in the public schools but should be taken care of by the family and the church. Have you been interested enough in this to favor one side over other? (IF YES) Which do you think--schools should be allowed to start each day with a prayer or religion does not belong in the schools?

	1. SCHOOLS SHOULD BE ALLOWED TO START WITH PRAYER 3. OTHER; DEPENDS; BOTH (1964-1968); DK; no interest; 5. RELIGION DOES NOT BELONG IN THE SCHOOL
Strong govt	Some people are afraid the government in Washington is getting too powerful for the good of the country and the individual person. Others feel that the government in Washington is not getting too strong. Do you have an opinion on this or not? 1.Opinion. the government has not gotten too strong 2. DK; depends; other; pro-con; no interest; no opinion 3. Opinion: the government is getting too powerful
Take advantage	Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair? 0. Would try to be fair; 1. Would take advantage
Trust govt	People have different ideas about the government in Washington. These ideas don't refer to Democrats or Republicans in particular, but just to government in general. We want to see how you feel about these ideas. How much of the time do you think you can trust the government in Washington to do what is right -- just about always, most of the time or only some of the time? 1. None of the time; 2. Some of the time; 3. Most of the time; 4. Just about always
Urban unrest	There is much discussion about the best way to deal with the problem of urban unrest and rioting. Some say it is more important to use all available force to maintain law and order -- no matter what results. Others say it is more important to correct the problems of poverty and unemployment that give rise to the disturbances. Where would you place yourself on this scale, or haven't you thought much about this? 1. Solve problems of poverty and unemployment 2.. 6 7. Use all available force
Waste tax money	Do you think that people in the government waste a lot of money we pay in taxes, waste some of it, or don't waste very much of it? 1. a lot, 2. some; 3. not very much
Women equal role	Recently there has been a lot of talk about women's rights. Some people feel that women should have an equal role with men in running business, industry and government. Others feel that a women's place is in the home. Where would you place yourself on this scale or haven't you thought much about this? 1. Women and men should have an equal role 2...6 7. Women's place is in the home

AGE: Age of respondents (VCF 0101)

COHORTS: To see the cohort effect, we construct cohort dummies from AGE. Our baseline cohort is the civil rights movement cohort, i.e., people born in 1935-1947.

PRE-CRM-COHORT: pre-civil rights movement cohort (1 for people born before 1935; 0 otherwise)

POST-CRM-COHORT: post-civil rights movement cohort (1 for people born after 1948; 0 otherwise)

EDUCATION: 1 = Grade school or less (0-8 grades); 2 = High school (12 grades or fewer, incl. non-college training if applicable); 3 = Some College (13 grades or more but no degree); 4 = College or advanced degree

FEMALE: 1=female; 0=male

INCOME: Only income brackets are provided in the NES. We chose a mid-point in each income bracket and converted it to the unit of $10,000.

MARRIED: Respondent's marital status: 1= married; 0= otherwise

MOBILITY: There are two questions asking about how people are getting along financially these days. One question asks whether the respondent is better off than (1), the same as (2), or the worse off than (3) he/she was a year ago (PERSONAL FINANCIAL SITUATION IN PAST YR). The other question asks PERSONAL FINANCIAL SITUATION IN NEXT YR. From these two questions, we constructed two dummy variables measuring upward mobility and downward mobility.

UPMOBILE=1 if the respondent is financially better off now than in last year and his/her personal financial situation is expected to be better next year; 0 otherwise

DOWNMOBILE=1 if the respondent is financially worse off now than in last year and his/her personal financial situation is expected to be worse next year; 0 otherwise

PROTESTANTISM: 2= protestant and attend church more than twice in a month; 1=protestant but attend church not regularly (less than twice in a month); 0=otherwise
PASTECONOMY: Would you say that over the past year the nation's economy has gotten better, stayed about the same or gotten worse? 1. Better; 3. Stayed same; 5. Worse
REGION: 1. Northeast (CT, ME, MA, NH, NJ, NY, PA, RI, VT); 2. North Central (IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, SD, WI); 3 South (AL, AR, DE, D.C., FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV); 4. West (AK, AZ, CA, CO, HI, ID, MT, NV, NM, OR, UT, WA, WY)
UNEMPLOYED: Unemployment dummy constructed from VCF0116 (Respondent's WORK STATUS)
1= temporarily laid off or unemployed; 2= otherwise
UNIONMEM: Union membership dummy constructed from VCF0127 (HOUSEHOLD UNION MEMBERSHIP)
1= someone in household belongs to a labor union; 2 = no one in household belongs to a labor union
URBANISM: This variable represents respondent's sampling address. 1=central cities 2=suburban area; 3=rural areas and small towns

Appendix 3: Kernel density estimator and asymptotic statistics

(1) The kernel density estimate for variable x with a sample $\{x_i\}$, which is independently and identically drawn from an unknown density f, is given by

$$\hat{f}(x) = \frac{1}{N_x}\sum_{i=1}^{N_x}\left(\frac{1}{h_x}K(\frac{x - x_i}{h_x})\right),$$

where x_i is the i^{th} sample point for variable x, N_x is the number of observations for variable x, h_x is a bandwidth (or a smoothing parameter), and $K(.)$ is a kernel function.

The kernel estimator clearly depends on the choice of a kernel and a bandwidth, but it is well known that the choice of a kernel is a minor issue. Indeed the difference between the values of the Mean Integrated Square Error attained by most kernels and the optimal kernel, often called the Bartlett-Epanechnikov kernel, is small (Silverman, 1986: p. 43). We chose the Gaussian kernel.

In contrast, the selection of a bandwidth is crucial. Several methods for estimating an optimal bandwidth have been suggested in the literature (e.g., cross-validation methods, plug-in methods), but these methods are computationally expensive and the rate of convergence is extremely slow, being of the order of $N_x^{-1/10}$. Also when the criterion function used in estimating the optimal bandwidth have several local minima, quite different values of estimated bandwidths may be derived for data sets coming from the same distribution. Therefore, in setting the optimal bandwidth, we follow the Silverman's rule of thumb:

$$h_x^{opt} = 0.9 * N_x^{-1/5} Min[Var_x, \frac{IQR_x}{1.349}],$$

where N is the number of samples, Var is the variance, and IQR is the inter-quartile range.

One minor issue is that the above estimates are based on the assumption that the support of the density is the entire real line. This assumption may generate a somewhat inaccurate estimate if the support is bounded. We find that the estimate of the wage distribution is somewhat inaccurate around the origin because there are many non-working individuals. So we adjust the density estimate by using the reflection method described in Silverman (1986: p.30). More precisely, we estimate the wage density by the formula:

$$\hat{f}(x) = \frac{1}{N_x}\sum_{i=1}^{N_x}\left(\frac{1}{h_x}K(\frac{x - x_i}{h_x}) + \frac{1}{h_x}K(\frac{x + x_i}{h_x})\right),$$

(2) The bias of the kernel estimator is:

$$Bias\hat{f} = E\hat{f} - f = \int K(\psi)[f(h_x\psi + x) - f(x)]d\psi \approx \frac{h_x^2}{2}\mu_2 f''(x),$$

where $\psi = \frac{x - x_i}{h}$, and its variance is given by

$$Var\hat{f} = \frac{1}{N_x h_x}\int K^2(\psi)f(h_x\psi + x)d\psi - \frac{1}{N_x}[\int K(\psi)f(h_x\psi + x)d\psi]^2 \approx \frac{1}{N_x h_x}f(x)\int K^2(\psi)d\psi.$$

(See Pagan and Ullah (1998, p. 22).)

It is well known that under some regularity conditions, the kernel estimator is asymptotically unbiased ($\lim E\hat{f} = f$), consistent weakly ($\hat{f} \xrightarrow{p} f$) and strongly ($\hat{f} \xrightarrow{a.s.} f$), and asymptotically normal ($\sqrt{N_x h_x}(\hat{f} - f) \xrightarrow{d} Normal(0, f\int K^2(\psi)d\psi)$). Hence a pointwise 95% confidence interval for the density estimate is:

$$\hat{f}(x) \pm 1.96\frac{1}{\sqrt{N_x h_x}}[f(x)\int K^2(\psi)d\psi]^{1/2}.$$

By replacing f with its consistent estimator (i.e, $\hat{f}$) and computing $\int K^2(\psi)d\psi$ (which is approximately 0.2821 if the kernel is Gaussian), we obtain the asymptotic confidence interval for $\hat{f}$.

(3) The Kolmogorov-Smirnov statistic is intended to evaluate the goodness of fit of two empirical distribution functions in terms of the sup norm. Suppose $\hat{F}_{N_1}(x)$ and $\hat{F}_{N_2}(x)$ are the empirical distribution functions of two (independent) samples $(X_1,...,X_{N_1})$ and $(Y_1,...,Y_{N_2})$. The KS statistic is $KS = \sup\left|F_{N_1}(x) - F_{N_2}(x)\right|$. Smirnov derives the limiting distribution of $\sqrt{\frac{N_1N_2}{N_1+N_2}}KS$: $\lim_{N_1,N_2\to\infty}\Pr(\sqrt{\frac{N_1N_2}{N_1+N_2}}KS \le z) = 1 - 2\sum_{i=1}^{\infty}(-1)^{i-1}\exp(-2i^2z^2)$. The p-value for the KS statistic is obtained by evaluating the limiting distribution of the KS statistic. Exact p-values can be computed, but we use the first 5 terms to form the approximate p-values.

(4) The bivariate density estimate $\hat{h}(\mathbf{z})$ for a sample $\{\mathbf{z}_i\} = \{(x_i, y_i)\}$ is given by the formula

$$\hat{h}(x,y) = \frac{1}{Nh^2}\sum_{i=1}^{N}\left(\frac{1}{h}K(\frac{x - x_i}{h}, \frac{y - y_i}{h})\right)$$
$$= \frac{1}{Nh^2\sqrt{\mathbf{V}}}\sum_{i=1}^{N}\left(\tilde{K}(\frac{(\mathbf{z} - \mathbf{z}_i)'\mathbf{V}^{-1}(\mathbf{z} - \mathbf{z}_i)}{h^2})\right),$$

where N is the number of observation for $\{z_i\}$, $\mathbf{V}$ is the sample covariance matrix of the data, $K(.,.)$ is the standard bivariate normal distribution and $\tilde{K}(.)$ is the function such that $\tilde{K}(z'z) = K(z)$; if $K(.,.)$ is the standard bivariate normal, $\tilde{K}(u)$ is equal to $\frac{\exp(-\frac{1}{2}u)}{2\pi}$ (Silverman, 1986: p. 78).

The independence assumption requires testing $H_0 : h(x,y) = f(x)g(y)$. Ahmad and Li show (Pagan and Ullah, 1999: p.71) that under H_0 and as $h \to 0$ and $Nh^2 \to \infty$, $T_1 = \frac{Nh\bar{I}_1}{\hat{\sigma}_3} \xrightarrow{d} Normal(0,1)$, where

$$\hat{\sigma}_3 = \frac{1}{N^2}\sum_{i=1}^{N}\hat{f}(x_i)\sum_{i=1}^{N}\hat{g}(y_i)\int[K_x(\psi)]^2 d\psi \int[K_y(\psi)]^2 d\psi ,$$

and

$$\bar{I}_1 = \frac{1}{(Nh)^2}\sum_{i\neq j}\sum_{j} K_x(\frac{x_i - x_j}{h})K_y(\frac{y_i - y_j}{h}) + \frac{1}{(N^2h)^2}\sum_{i\neq j}\sum_{j} K_x(\frac{x_i - x_j}{h})\sum_{i\neq j}\sum_{j} K_y(\frac{y_i - y_j}{h})$$
$$- 2\frac{1}{N^3h^2}\sum_{i\neq j\neq k}\sum_{k} K_x(\frac{x_i - x_j}{h})K_y(\frac{y_j - y_k}{h}),$$

here $K_x(.)$ is the kernel for $\hat{f}(.)$ and $K_y(.)$ is the kernel for $\hat{g}(.)$.

(5) A local regression scatter plot smoother known as lowess fits a line to a scatter plot by estimating the relationship between y and x at a number of target points over the range of the observed x values. It first identifies the q nearest neighbors of a target point x_0, denoted by $N(x_0)$, and then calculates weights w_i for each point in $N(x_0)$ using a weight function $W(\frac{|x_0 - x_i|}{\max_{N(x_0)}|x_0 - x_i|})$. Then it regresses y on $(1,x)$ for local linear fitting, using weighted least squares. Repeating this procedure for each target point traces out a function, the smoothed fit of y against x. As in the case of density estimation, the calculated smoother clearly depends on the choice of a weight function and a bandwidth. The choice of a weight function is a minor issue; we chose the tricube weight function: $W(z) = (1 - z^3)^3 I_{[0,1)}(z)$. Bandwidths could be estimated using cross-validation or plug-in methods as in the case of density estimates.

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