Confronting Political–Economic Theories of Voting with Evidence

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This paper illustrates one strategy for testing a theory of economic influences on voting. We use a competitive equilibrium model of the economy to determine the impact of an individual's economic position on his or her economic interests and, ultimately, political interests. We then test whether this impact is observed in voting behavior, addressing the resulting specification and estimation problems in the context of U.S. presidential election data. Our empirical results suggest that, despite these formidable problems, we can usefully connect political–economic models and discrete-choice (probit) models of voting.

1 Introduction

ONE OF THE best-documented findings in election studies is that economic conditions influence voting (e.g., Lewis-Beck 1988). How they influence voting, unfortunately, is less clear. How, for instance, do voters balance their direct personal economic interests against national economic concerns? We do not fully understand the mechanisms by which economic conditions affect political behavior. This gap poses an obvious challenge to political economists. What is perhaps less appreciated is the challenge it poses to political methodologists.

The issues methodologists most often consider in political–economic analysis—autocorrelation, heteroscedasticity, lag structures, small sample properties of estimators, and the like—are real and important. Yet Lucas' (1976) discussion of the econometrics of policy analysis suggests strongly that even when all these standard problems are successfully addressed, the usual regression estimates in voting studies are not necessarily interpretable in a theoretically relevant way. For the underlying political–economic model of voting behavior must spell out the voter's fundamental preferences over economic goods and the context in which those preferences are revealed. Otherwise, the rules governing the

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voters' political decisions—not just the decisions themselves—will depend on the policy and party choices they face. As a result, the parameters we estimate will be unstable.

Consider the well-known finding that voting depends more on the voters' assessment of aggregate economic conditions than on the contents of their individual pocket books (Kinder and Kiewiet 1979). The correct interpretation of this finding is by no means obvious and still in dispute. As Kinder and Kiewiet recognize, for example, voters who focus on aggregate conditions are not necessarily less self-interested than those who focus on their pocket books. They simply may view aggregate conditions as better predictors of their economic future. Refining this idea, Nagler and De Boef (1999) suggest that voters may use those in economically similar circumstances as reference groups for judging economic conditions. This judgment, in turn, might be sensitive to retrospective or prospective evaluations of a political party's role in causing aggregate or individual results.

Evidently, to interpret statistical relations between aggregate and individual economic conditions, on the one hand, and votes, on the other, we need to understand the precise mechanisms anchoring these relations. Specifically, we must understand how the impact of economic policies is propagated within the economy, how these policies thereby affect voters' economic interests, and how these interests affect their political interests. The question we must address, then, is how the economic position of individuals translates into political preferences.

Our paper illustrates one way an articulated political–economic model of the United States can be used to derive hypotheses about this translation. We test these hypotheses on American National Elections Studies (ANES) presidential election data. The paper does not offer a template. In other words, its methodological analysis does not itself constitute a method. Still, progress through examples is worth pursuing. For one thing, the topic of voting is important, and the dearth of foundational theories linking economic conditions and voting is embarrassing. For another, the relative dearth of foundational theories is not due to an oversight. There are formidable obstacles to developing and testing our theory, or any theory, of economic influences on voting. These obstacles include the following.

1. To explain the connection between an individual's economic and his and her political interests our theory must model how politics affects economic interests, and this means understanding how the individual's economic interest is determined. This is the fundamental problem that a purely econometric approach neglects.
2. Our analysis must reconcile economic and political dynamics. As data generating processes, for instance, elections are much more highly temporally aggregated than is economic production. We confront this problem in a number of places in our analysis.
3. In linking economic interests to political choices we must also link individuals' economic concerns to the political alternatives they face. For example, preferences over consumption alternatives must be linked to partisan preferences. This means, in addition, that choices regarding continuous economic variables must be mapped into discrete political choices.
4. We as observers and the agents we model derive statistical estimates under different constraints often using different data. These agents are required to make action-relevant decisions in circumstances in which we as observers would forbear due to the risk of making Type II errors.
5. Testing a political–economic theory of voting introduces special problems. For any theory capable of giving articulate answers to the questions posed to it is bound to be highly simplified. And the very simplification that helps generate answers severely

complicates the task of confirming them. In particular, a stochastic general equilibrium model of the economy, which we believe is needed to address the first point above (see, e.g., Freeman and Houser 1998), will often have implications for more statistical moments on far more dimensions than the theory is intended to produce. Since a classical statistical approach holds the theory accountable on all these dimensions, one must take great care in formulating appropriate tests.

2 The Political–Economic Voting Model

We use a standard economic model to determine individual economic interests (see the Appendix). However, instead of relying on the standard representative agent, we posit two classes of economic agent. One class works in a competitive labor market but neither owns nor accumulates capital. This corresponds to the working class on which political sociology has lavished so much scholarly attention. The other class both works and makes investments. This group, corresponding to the middle class, makes investment decisions with the dynamics of the economy in mind. These dynamics result from the governing party's tax policy. Parties of the Left increase the flat tax on investment income and transfer the proceeds in equal lump sum payments to those who do not own capital. Parties of the Right decrease the tax. There are regular elections decided by majority vote. Election outcomes are uncertain due to shocks to voters' estimates of the impact of policy on their utility.

We assume, then, that workers and owners of capital operate in competitive labor and capital markets which, conditional on partisan tax policy, determine their fundamental material interests and thereby their political preferences. These preferences do not represent a "standing decision" but depend on the particular conjunction of economic conditions and party policy proposals. In this analysis, then, the specific position of individuals in the economy is crucial to predicting their partisan preferences.

In a series of publications Alberto Alesina (e.g., Alesina and Roubini with Cohen 1997) has developed an important alternative approach to understanding partisan economic effects. In the model associated with this approach, there are uncertain elections between a party of the Left favoring low unemployment and high economic growth at the expense of higher inflation and a party of the Right with the opposite priorities. The two parties implement these goals through relatively loose and relatively tight monetary policy, respectively. Therefore to the extent that there is a surprise victory of the Left, there is surprise inflation. Meanwhile, labor contracts signed in advance of elections have set wages based on expected inflation. An inflation shock thus reduces real wages and increases employment and output; conversely, a surprise victory of the Right lowers employment and decreases output. In this manner, Alesina explains the persistent partisan difference in post-WWII economic performance in the United States, where Democrats are associated with lower unemployment and higher growth.

For our purposes, there are four problems with this approach.

1. We are interested in the impact of economic position on individual voting behavior. Alesina's specific formulation, in contrast, analytically separates the voting population and the economic population.
2. More important, the impact if modeled would be ambiguous in crucial cases. For example, in his model the increased output associated with the party of the Left is purchased by a decrease in the real wages received by its ostensible working class constituency; the pure beneficiaries are employers (and perhaps the unemployed).

3. It is not entirely clear why in this analysis wage setters fail to write contingent contracts insulating wages and profits from inflation shocks strong enough to create measurable partisan economic cycles.
4. Rigorous tests of the election surprise hypothesis have been decidedly mixed (e.g., Alesina and Roubini with Cohen 1997; Faust and Irons 1999; Blomberg and Hess 2000; for a summary see Drazen 2000).

3 Implications of the Model

In the competitive equilibrium for the political economy described in Section 2, it turns out that workers supply their labor inelastically, so their decision problem is purely political: to determine which party's tax policy is preferable. While the middle class's political decision is straightforward—vote for the party of the Right—they must make an economic decision about the appropriate level of savings, which means trading off present for future consumption. We show in the Appendix that the middle class's savings policy generates an equilibrium savings rule. This rule implies that savings decrease when the expected tax on capital income increases.

The reduction in savings has two consequences for members of the working class. First, as we show in the Appendix, each member's after-tax labor income decreases with increases in the expected tax. Thus the impact of a tax increase is partially shifted onto labor. Second, there is a change in the transfer payment. The quantity and direction of this change, however, are contingent on the level of the tax, on the value of particular parameters associated with the economy, and on the size of the population receiving the transfer. This last consideration is easily explained: the larger the recipient population, the greater the dilution of the transfer.

Based on these consequences we propose two testable hypotheses. First, the larger the size of the population receiving the transfer, the less likely *ceteris paribus* is the working class to support a tax increase on capital. Call this the Transfer Dilution Hypothesis. The second hypothesis depends on actual tax levels and parameter values. Yet for the values of the capital tax and the parameters during the post-WWII sample period (see, e.g., McGrattan 1994), the model predicts that the higher the expected capital income tax, the less likely *ceteris paribus* is the working class to support an increased tax on capital. Call this the Moderate Worker Hypothesis.

The contingency of working-class policy preferences has a significant methodological implication. If the Moderate Worker Hypothesis is correct, the impact of U.S. workers' class position on their voting cannot be measured by their disposition to vote for Democrats. As Hout et al. (1995) argue, one must distinguish between class voting, understood as the tendency of members of a class to vote the same way, and the tendency of a given class to vote for a particular party.

4 From Economics to Politics

To test the hypotheses developed in the preceding section, we need to be sure that when voters choose between actual political alternatives—here, Democrats and Republicans—their choices can be interpreted as reflecting a preference for higher or lower taxes on capital income. In particular, mapping our analysis of working-class tax preferences into observed partisan preferences, we want to say that the working class is less likely to prefer Democratic tax policy whenever the working class prefers lower taxes on capital income. If this mapping is successful, we have satisfied point 3 in the Introduction (Section 1), requiring an explicit link between economic and political preferences. In the present context, this means confirming that the Democrats can be identified with the party of the Left in terms

Table 1 Democrats and capital income tax growth ($N = 49$)

KTax	*Coeff.*	*SE*	*95% confidence interval*	
Dem	0.3*	0.1	0.03	0.54
LTax	1.5**	0.33	0.85	2.18
KTax$\{t-1\}$	0.9**	0.2	0.65	1.18
LTax$\{t-1\}$	−1.8**	0.4	−2.56	−1.13
Def$\{t-1\}$	−0.007**	0.002	−0.012	−0.002
Dem × KTax$\{t-1\}$	−0.3**	0.2	−0.676	−0.001
Dem × LTax$\{t-1\}$	−0.5*	0.22	−0.940	0.038
Constant	0.1	0.1	−0.093	0.305

Note. * $p < 0.05$; ** $p < 0.01$. Adjusted $R^2 = 0.832$. Root MSE = 0.018.

of their impact on the capital income tax. Once this identification is secured, we can be more precise. We can determine the expected Democratic capital income tax conditional on various circumstances and then see whether this expected tax rate influences vote choices.

Beginning simply, we regress capital income tax (KTax) on a partisan dummy variable (Dem) for the party of the president, the labor income tax (LTax), a one-period lag of capital income tax (KTax$\{t-1\}$), a one-period lag of labor income tax (LTax$\{t-1\}$), the lagged deficit as a percentage of the GDP (Def$\{t-1\}$), and interactions between the party dummy and lag taxes (Dem × KTax$\{t-1\}$ and Dem × LTax$\{t-1\}$). The result shown in Table 1 suggests that Democratic incumbency is positively associated with growth in KTax for 1947–1996.[1] Due to the interaction terms, the estimated coefficient on Dem is conditional: $0.3 - 0.3\text{KTax}\{t-1\} - 0.5\text{LTax}\{t-1\}$.[2] This coefficient is positive for all sample tax values.

Unfortunately, the statistical relation between Democratic presidents and capital income tax rates is not decisive since the relation may be spurious. For example, voters who anticipate higher tax rates may elect Democrats to manage the increased revenue. In short,

[1] The source for Def$[t-1]$ is the 1999 Economic Report of the President. The two tax series for 1947–1987 and 1988–1992, operationalized as the average effective marginal rates, are from McGrattan (1994) and McGrattan (personal communication), respectively. The latter series, in KTax, LTax pairs, is 0.4551, 0.2608; 0.4543, 0.2583; 0.4428, 0.2595; 0.4398, 0.2619; 0.4537, 0.2596. Following McGrattan, the 1993–1996 series was computed using the definitions of Joines (1981), yielding 0.5262, 0.2795; 0.5159, 0.2804; 0.4861, 0.2874; 0.4153, 0.2834. Effective tax rates, it should be noted, are difficult to calculate, and there is considerable variation in the existing estimates. An estimation strategy more sensitive to measurement error, say along the lines of Sargent (1989), might be helpful. An alternative strategy would be to parallel Padovano and Galli's (2001) estimate of effective marginal income tax rates by regressing revenue on GDP. Finally, except in the case of the subsequent VAR and the calculation of the corrected standard errors for the probit analysis (using GAUSS), all statistical analysis was performed using Stata 6.

[2] Technically, the standard error also needs to reflect the interaction terms. When KTax and LTax are set to their sample means, the revised standard error for Dem is 0.09. The Breusch–Godfrey test for autocorrelation of disturbances was negative, as was a White test for heteroscedasticity at the 0.05 level. In light of substantial tax changes during the Reagan years, we performed Chow tests splitting the sample in half as well as at 1981, 1982, 1983, 1986, and 1987, but there were no statistically significant differences. On the other hand, Table 1 suggests the possibility of a unit root, which is supported for one lag by Dickey–Fuller and Phillips–Perron tests (likewise for LTax); the possibility of a deterministic trend was rejected. A (Johansen) test for cointegration of the tax variables was positive. A KPSS test, however, failed to reject the null of level stationarity for KTax. On theoretical grounds and consistent with the model assumptions, moreover, tax rates have finite variances. Given these considerations and in light of the relatively low power of these tests, the analysis is conducted in levels [on tempering inferences about unit roots by theoretical judgment see Williams (1992), but compare Beck (1992); for a more econometric view see Juselius (1999), which in this case would emphasize the frequent absence of mean reversion in the medium–long run]. Note that the problem of spurious regression between the tax series is not directly relevant to the issue tackled in the text. De Boef and Granato (1997) find that for near-integrated processes the lag structure used here works reasonably well.

Table 2 Impulse response function for VAR

Response of KTax to shock to	*Response*			
	At year 1	*At year 2*	*At year 3*	*At year 4*
Dem(1)	0.100	0.045	0.005	−0.017
Dem(1) × KTax{t−1}	0.002	0.001	0.000	−0.001
Dem(1) × LTax{t−1}	−0.001	−0.002	−0.004	−0.005

Democrats cannot be plausibly construed as causing a higher KTax unless this problem of endogeneity is addressed. To do this, we use the impulse response function derived from a vector autoregression (VAR). The purpose of this function is to isolate the impact of a shock to the partisan dummy on KTax. By definition, this component of the partisan effect could not have been anticipated by voters. In other words, although anticipated effects may also be part of the causal story, the tax shock captures the unpredictable component of partisan policy. The shock, therefore, can be used to address the cross-equation feedback characteristic of the two-way dynamics of party and economy.

Table 2 reports the impulse response from a VAR in which a separate partisan dummy, Dem(1), is created for the first year of a Democratic term (cf. Faust and Irons 1999). These results suggest that a shock to Dem(1) has a positive impact on KTax for the first 3 years of a Democratic administration and a negative impact in the fourth year.[3] Taking into account the interaction effects, the net impact on KTax of a 1-unit shock to the Democratic dummy over the 4 years is an increase in the tax rate of 0.123. This needs to be put in the context of low year-to-year variation in the actual data.

5 Testing the Hypotheses

As a result of this mapping of model alternatives into U.S. election alternatives, we can now focus on point 5, devising an appropriate test of the Transfer Dilution and the Moderate Worker Hypotheses. An approach in the spirit of the computational experiments advocated by Kydland and Prescott (1996) would assign values to the parameters based on independent studies designed to estimate them. It would then use exogenous shocks, in this case shocks to consumption and policy, to simulate the model to see how closely various moments of the artificially generated sample mimic historical sample moments. What motivates this approach is in part an understandable skepticism toward the traditional practice of using the same historical sample to estimate and test a model. But the computational approach typically relies on informal verdicts about model fit that are often disputed. Alternatively, as we noted above, the highly simplified nature of the original models usually causes them to fail strict econometric tests (see, e.g., Geweke 1999). Furthermore, the time series for post-WWII presidential voting is fairly short.

Recently Geweke (1999), Schorfheide (1999), and others have begun developing Bayesian methods for addressing the fundamental problems associated with highly simplified

[3]The VAR, implemented through RATS 4.30, was identified using a Choleski decomposition with an assumed ordering of Dem(1) × LTax{$t-1$}, Dem(1) × KTax{$t-1$}, Dem(1), Deficit (deficit as a percentage of the GDP), LTax, and KTax. The position of Deficit was influenced, in part, by evidence of an error-correcting mechanism with respect to budgets (Wood 2000). A block exogeneity test for the three political variables was positive. The one-period lag length was based on t- tests and the Schwartz Bayesian criterion, which particularly rewards parsimony. This criterion, however, only slightly favored a one- over a two-period lag, which is consistent with Faust and Irons' (1999) finding in their study of partisan effects on other macroeconomic variables that a six-quarter lag was appropriate.

models. Still, it may be useful to devise a test exploiting the two influences on worker tax preferences identified in Section 3, namely, the effect on wages and the effect on transfers. Combined, these influences determine a criterion for a working-class member's preferring an increased or decreased tax on capital income. When their combined influence is positive, model workers support an increase; when negative, they oppose it. Thus viewing their combined influence as a criterion for partisan preference, we can connect our two key hypotheses—Transfer Dilution and Moderate Worker—to statistical techniques for discrete choice that are more familiar to political scientists and for which ample data are available from the ANES. Based on the derived criterion, called C in the Appendix, we can interpret the worker's vote choice as embodying a qualitative response model determining the conditions under which the worker supports the Democrat ($C > 0$) and the worker supports the Republican ($C < 0$). Noting the worker's uncertainty concerning the net impact of tax policy on his or her consumption, this in turn suggests testing the criterion in terms of the function prob(Dem) $= G(\boldsymbol{\beta}^{\mathrm{T}}\mathbf{x})$, where $\boldsymbol{\beta}^{\mathrm{T}} = (b_0, b_1, b_2, b_3, \ldots, b_n)$, $\mathbf{x} = (1, E(\mathrm{KTax}'), E(S'), E(\mathrm{LTax}'), x_5, \ldots, x_n)^{\mathrm{T}}$, where E is the expectation operator, S designates the number of next period's transfer recipients, a prime indicates the next period, the superscript T denotes transpose, prob(Dem) is the probability that workers support the Democrat, the composite coefficients b_1, b_2, and b_3 are functions of the actual model parameters, and the x_i ($i \geq 5$) denote factors extraneous to the model.

In short, we are led to consider a probit analysis in which we make use of the worker's residual uncertainty about the net impact of tax policy on his or her consumption. The resulting test consists of determining whether the composite parameters b_1 and b_2 have the proper signs. Thus we break from the computational approach by treating the parameters composing the coefficients of criterion C qualitatively. Consistent with computational methodology, however, we do not test the model on the same data set used to generate expected tax rates and measures of the size of the transfer recipient group.

A qualitative response model thus has a number of advantages. It also has one serious disadvantage. In the case of nonlinear techniques such as probit, omitted variables bias can infect the resulting analysis even when these variables are uncorrelated with the existing regressors. Therefore, we must add suitable control variables to the actual model. Unfortunately, while it is natural to control for an individual voter's religion, level of education, and the like, C says nothing about the impact of such demographic characteristics. As a result, the specific controls we use have no greater justification than any list of variables taken from "whatever demographics the survey researcher might have collected" (Achen 2000, p. 144). By the same token, the utility theory anchoring probit (and logit) assumes that utility is linear in the relevant variables. In the Appendix, we show how voting criterion C can be loglinearized.

The next step is to operationalize the expectations incorporated in the criterion. An obvious approach is to interpret the key capital tax expectation in the probit analysis as the predicted value from a regression of lnKTax on an appropriate set of variables. Yet this interpretation of $E(\mathrm{lnKTax}')$ introduces three new complications.

First, using this generated regressor in the actual probit yields a biased asymptotic covariance matrix (Murphy and Topel 1985; Greene 2000, p. 135). We discuss the appropriate correction below, following the formula given by Murphy and Topel.

Second, the variance inherited from the generated regressor $E(\mathrm{lnKTax}')$ cannot be computed in the usual way, for $E(\mathrm{lnKTax}')$ is calculated from the regression coefficients conditional on a Democrat assuming office. Therefore the estimated variance of $E(\mathrm{lnKTax}')$ should reflect only outcomes in which the regression residual was meaningful, that is, years

Table 3 Forecasting regression for $E(\text{lnKTax}')$, 1947–1996

lnKTax	*Coeff.*	*SE*	*95% confidence interval*	
lnKTax$\{t-1\}$	0.7**	0.12	0.49	0.95
lnLTax$\{t-1\}$	−0.37**	0.076	−0.527	−0.218
Dem	−0.02	0.038	−0.093	0.062
Def $\{t-1\}$	−0.013*	0.006	−0.025	−0.003
Dem × lnLTax	−0.2	0.15	−0.54	0.05
Dem × lnKTax	0.102	0.064	−0.028	0.231
Constant	−0.8**	0.14	−1.05	−0.46

Note. * $p < 0.05$; ** $p < 0.01$. Adjusted $R^2 = 0.737$. Root MSE = 0.046.

in which a Democrat had in fact won. Clearly, this restriction increases the variance in the estimate.

Third, we face the recurring problem of reconciling annual tax series and quadrennial election data. In light of this problem, we calculated the corrected covariance matrix in two stages. We extracted the relevant election-year expectations. We then duplicated each of these single-year results to make the observation matrix for the regression conformable with the one used in the probit analysis, which has multiple observations for each election year. This procedure further inflates the impact of the residuals from the first-step regression since each one is multiplied by the number of ANES observations for the relevant election year [see Murphy and Topel 1985 (pp. 374–375) for a technical discussion relevant to this case].

Our general strategy, in any case, is to organize the regression and probit as a two-step, limited-information maximum-likelihood estimation allowing for corrected standard errors. Since we lack a specific hypothesis about the joint distribution of the random components of the first and second stages, we do not use full information methods.

Table 3 displays the first-step forecasting regression generating values for $E(\text{lnKTax}')$, where Dem × lnLTax and Dem × lnKTax stand for the interactions of Dem with one-period lags of lnKTax and lnLTax, respectively.[4] This forecast parallels the original "causal" regression except for the substitution of log transforms of the KTax and LTax variables and the elimination of the contemporary LTax.[5] In light of the positive association between Democrats and KTax, the negative coefficient on Dem in Table 3 may seem puzzling. This table, however, reports a regression of lnKTax on lnKTax$\{t-1\}$ (among other variables), a model that is observationally equivalent to a regression in which lnKTax - lnKTax$\{t-1\}$ is the dependent variable. The first difference of a log variable is approximately the rate of growth of the variable. Apparently the negative coefficient reflects the hesitancy (or inability) of Democrats to increase the proportional rate of growth of taxes.

The final preliminary step is to operationalize $E(\text{lnS}')$, expected log deviation of the size of the population receiving pure transfers.[6] This task is complicated by the difficulty of

[4] As we discuss in the Appendix, the variables here are technically log deviations from steady-state values. Tests for autocorrelation were negative, as was a White test for heteroscedasticity.

[5] Relevant to point 4 in the Introduction (Section 1), this forecast is based on the entire series, which partly compensates voters for the absence of candidate- and administration-specific information in the model. A more sophisticated alternative is to model the formation of expectations in terms of sequential least-squares learning (e.g., Sargent 1989). Also, though not affecting the actual forecast, the standard error for Dem corrected for the interaction terms is 0.031.

[6] Assuming perfect foresight for labor taxes, we use the exogenous lnLTax′ instead of $E(\text{lnLTax}')$ to avoid the additional complications attendant on calculating the asymptotic covariance matrix when both expectations are generated. The correlation between the actual and the predicted lnLTax is 0.98.

computing yearly estimates, the numerous forms that transfers take (e.g., unemployment compensation, Medicaid, Medicare, Social Security, and AFDC), the changing demographics of the recipient population, and the requirement that voters predict their recipient status over time.

In light of these problems, we operationalize $E(\ln S')$ using generational accounting principles (e.g., Auerbach et al. 1994). We computed average net tax rates (NetTax) for individuals who were 38 years old in each election year in the sample. NetTax, which empirically is always positive, is the expected difference between income taxes and transfers over a lifetime. We then interpolated these figures as a weighted average from rates calculated decennially for individuals born 1910 to 1960 (Auerbach et al. 1994, p. 86), hence the initialization of the 1948 election for individuals 38 years old. The basic idea is to treat these estimates as measures of the dilution of the representative individual's per capita transfer net of the recipient's income taxes, since the latter do not affect transfers in the model. In keeping with the linearization procedure noted above, we used lnNetTax.

In short, we test the Transfer Dilution and Moderate Worker Hypotheses with an individual-level probit analysis of workers' voting in pooled 1948–1996 presidential elections. We restrict the sample to workers—specifically, nonservice, nonfarm workers based on ANES occupation categories—for three reasons. First, the existing class analysis literature strongly emphasizes working-class political behavior. Second, the claim that voters are sensitive to the tax on capital income faces its most difficult test in the case of a class that by and large does not directly pay the tax. Third, a test using all voters and introducing a dummy variable for class would enhance the separate regression only if the relevant slope coefficient were assumed to be identical for both classes. This assumption, however, contradicts the model we are testing.

Table 4 reports the probit results (with uncorrected standard errors) using ANES (1948–1996) presidential election data controlling for Age; Gender (male = 1); Education (6-point scale); family Income; a regional dummy, South (=1); Party ID (7-point scale; 0 = strong Democrat); race (black = 1, Orace = nonblack and nonwhite = 1); religion; a dummy variable indicating a Democratic incumbent (DemInc); real Growth in GDP; rate of Unemployment in November of the election year; change in real personal disposable income in the election year (PDI); and change interacted with DemInc (DemPDI).[7] We coded a vote for a Democrat as 1 and a vote for a Republican as 0.

The signs on ln(NetTax) and $E(\ln KTax')$ are as hypothesized. Both are negatively associated with voting for the Democrat and, uncorrected, are statistically significant at the 0.01 level.[8] In short, Table 4 provides evidence for the Transfer Dilution and Moderate Worker Hypotheses. Although our principal aim is to test the influence of economic position rather than its relative importance, a change in each of the two key variables evaluated at their sample means has a higher numerical impact on the cumulative probability of voting Democrat than any other independent variable except Unemployment, whether or not the impact of PDI incorporates the interaction term.[9]

[7] Income is in constant chained 1982–1984 dollars by annual CPI computed by the Bureau of Labor Statistics; Growth in GDP is from the 1998 Economic Report of the President, Historical Tables; Unemployment is from the Current Population Survey, Bureau of Labor Statistics Series LFS21000000; and change in real personal disposable income is from the Bureau of Economic Analysis. The 1948 observations are based on retrospective 1952 data (the qualitative results are the same when 1948 is excluded). The qualitative results are also the same when we correct for different size samples by election year.

[8] The standard error for PDI corrected for its interaction with DemInc is 0.098.

[9] Since $\ln'(x) > 1$ when $x < 1$, the theoretically dictated form of the key variables confers an advantage on them in this calculation. With regard to the untransformed variables, $E(\text{KTax}')$ has the largest impact.

Table 4 Probit estimates for 1948–1996 elections ($N = 3509$)

Vote	*Coeff.*	*SE*	*95% confidence interval*	
Age	0.007**	0.0019	0.0034	0.0108
Gender	−0.09	0.063	−0.214	0.0334
Education	0.05*	0.020	0.012	0.092
Income	5.17*e*−07	2.44*e*−06	−4.26*e*−06	5.29*e*−06
South	−0.03	0.018	−0.061	0.009
Party ID	−0.44**	0.016	−0.469	−0.407
Black	0.5**	0.08	0.34	0.65
Orace	−0.4	0.20	−0.78	0.02
Catholic	0.12*	0.060	0.005	0.238
Jewish	0.2	0.23	−0.22	0.69
Growth	3.8**	1.0	1.87	5.79
lnNetTax	−13.5**	2.17	−17.71	−9.20
Unemployment	−7.7**	2.64	−12.89	−2.52
DemInc	−1.0**	0.22	−1.46	−0.62
PDI	−0.25**	0.035	−0.322	−0.187
DemPDI	0.55**	0.066	0.420	0.678
lnLTax′	1.0**	0.61	−0.21	2.16
E(lnKTax′)	−4.1**	0.36	−4.81	−3.42
Constant	45.7**	8.64	28.76	62.64

Note. * $p < 0.05$. ** $p < 0.01$. Pseudo R^2 [1 − (constant-only log-likelihood) / (full-model log-likelihood)] = 0.3691.

For reasons we noted above, the corrected covariance matrix implies very large standard errors.[10] Yet the standard error for E(lnKTax′) is lower than that for all single election-year variables except for PDI and DemPDI, and historically PDI is a leading predictor of election outcomes. Clearly, we need additional study to understand the appropriate integration of these kinds of "duplicated" variables, even more so when they are generated regressors. In any case, the uncorrected two-step procedure does produce consistent estimates.

Since the two variables of interest are economic, it is worth noting that we experimented with all combinations of the economic controls—real growth in GDP, change in real personal disposable income, and unemployment. Adding variables only increased the statistical strength of the key relationships.

Our use of party identification as a control variable raises two possible concerns. First, Achen (1992) questions whether this variable is stable over the life cycle, indeed whether it has any independent meaning. It is unstable and dependent, he argues, since Party ID is inherited from parents and then updated in Bayesian fashion based on later political experiences. Similarly, Lockerbie (1989) finds evidence that individuals change their partisanship based on their expectations concerning the ability of parties to produce prosperity. With this point in mind, we performed the probit analysis both with and without the Party ID variable. We found no relevant qualitative or statistical difference between the models.

Second, Party ID may be a consequence, not a cause, of vote choice. If so, our probit analysis suffers from endogeneity bias. However, Franklin and Jackson (1983) find that vote choice does not dictate Party ID. For our part, we found no correlation between Party ID and our two key variables. Moreover, the correlation between Party ID and the probit residuals

[10] For example, the "corrected" standard error for E(KTax′) is 22,664.403.

is −0.0034. This suggests that Party ID is neither correlated with nor a rationalization of vote choice based on taxes.

Our assumption that the coefficient for region is stable over a period experiencing a dramatic partisan shift in the South is also troubling. We split the regional dummy (South) into pre- and post-1964 periods, but evidently there are too few pre-1964 observations to evaluate the two variables of interest, which of course vary only across elections. An alternative approach is to interact region with a counter variable designed to capture the partisan evolution in the South. The counter variable, however, renders lnNetTax statistically insignificant, which is not surprising given the strong trend that it too exhibits. Our finding in favor of the Transfer Dilution Hypothesis, therefore, is less secure than the finding in favor of the Moderate Worker Hypothesis.

6 Conclusion

The preceding analysis offers one example of a voting theory supporting testable hypotheses about the economic source of political preferences. We accomplish this by linking a dynamic political–economic model to a discrete-choice voting model, which seems a promising alternative to strict computational methods. Our analysis (1) produces a model for deriving each agent's economic interests, (2) recognizes differences between the dynamic structure in which these interests develop and the dynamic structure in which they are politically expressed, (3) maps economic preferences into political preferences, (4) addresses the different motivations of scientific observers and model agents when they draw inferences from data, and (5) can be tested despite the stark simplifications needed to accommodate the preceding requirements. Under these constraints, unfortunately, an example can be only instructive, not prescriptive.

Even though we imposed some simplifications on the model only in the interest of greater analytic transparency and ease of exposition, the necessary constraints are formidable. One may wonder whether they are justified. In light of what he argues are unreasonable simplifications in large-scale macroeconomic models, Sims (1980), for example, advocates the use of unrestricted VARs in cases when there is little or no theoretical guidance for empirical analysis, the situation in voting studies described by Achen (2000). And if Sims is correct, one might argue, what political science needs is a more rigorous acceptance of atheoretical analysis rather than a strained use of theory.

There are, however, two related problems with this recommendation: (1) it is widely agreed that VARs have not obviated the need for theoretically motivated restrictions on variables and parameters, restrictions that must be introduced to generate useful and interpretable results (e.g., Granato and Smith 1994); and (2) political scientists are concerned with the way in which changes in voting rules, party ideology, and policy affect elections. Yet without a theory characterizing the voter's fundamental strategic problem, the validity of our understanding of voter choice may be limited to the particular historical sample from which parameter estimates are made (see Lucas 1976). Extrapolating to changed circumstances becomes fundamentally problematic. Absent theory, in other words, we may find ourselves in the position of students of electoral realignment, who too often have found ingenious ways to tell us that realignment will occur when the electorate is realigned. In this paper, in contrast, even though one of our hypotheses about worker support for Democrats is contingent on particular parameter values, the model can generate hypotheses for alternative values. In this sense, we have developed a general approach that holds the promise of a genuine theory of voting.

Appendix

We begin by formally characterizing the economic model. There is a continuum of individuals $j \in [0,\ p_t]$, $1 < p_t < \infty$, each seeking to maximize

$$E_0 \sum_{t=0}^{\infty} \beta^t [U(c_{jt}) + \nu_{jt}(\tau_{kt})] \tag{A1}$$

where E_0 is mathematical expectation conditioned on information available at time 0, $\beta \in (0,1)$ is the common temporal discount factor, $c_{jt} \geq 0$ is j's consumption at time t, momentary utility $U(c_{jt}) = \ln(c_{jt})$, and $v_{jt}(\tau_{kt})$ is an independently distributed and serially uncorrelated standard normal random variable reflecting j's uncertainty about the net impact of the capital income tax, τ_{kt}, on his or her consumption. This uncertainty plays a direct role only in the testing of the model.

There is a single profit-maximizing firm whose production is described by

$$Y_t = F(K_t, L) \equiv K_t^{\alpha} L^{1-\alpha} + \varepsilon \geq C_t + K_t, \qquad 0 < \alpha < 1, \qquad \varepsilon > 0 \tag{A2}$$

where Y_t, K_t, and C_t designate aggregate output, capital, and consumption, respectively; the amount of aggregate labor L is constant; and ε, assumed to be very small, ensures that $F(0,L) > 0$. The latter condition does not affect the empirical results but is technically useful. Since this is constant-returns-to-scale production, the firm behaves as though the market were competitive. Available aggregate capital is given by

$$K_{t+1} = (1 - \delta)K_t + Y_t - C_t \tag{A3}$$

with δ the rate at which capital depreciates. Individual holdings follow the same law of motion.

To give the model more demographic structure, we assume that the economically active part of the population is divided into two groups or classes: {W}, the working class, each of whose members has no capital and accumulates none; and {M}, the middle class, whose members start out with identical amounts of capital. All individuals supply 1 unit of labor. The size of the two groups at time t is designated W_t,$\mathrm{M}_t > 0$ respectively, and $M_t + \mathrm{W}_t = L$ is assumed to be constant and normalized to unity. The remaining $p_t - 1$ portion of the population consists of nonworking transfer recipients who own no capital. Typical members of {M} and {W} are designated m and w, respectively.

Designate the wage rate w_t (note the time index), which equals the marginal product of labor; the rental rate on capital r_t, which equals the marginal product of capital; the amount of privately owned capital $k_{jt} \geq 0$ (initial $k_0 > 0$ given); the tax on labor income τ_{wt},$0 < \tau_{wt} < 1$; and the tax on capital income τ_{kt},$0 < \tau_{kt} < 1$. Consumption by individual members of {M} is determined by the after-tax wage, $(1 - \tau_{wt})W_t$, and return on capital, $(1 - \tau_{kt})r_t k_{jt}$, net of savings. Consumption by members of {W} is determined by the after-tax wage plus any transfers from government. These transfers are derived from the tax on capital income and are given in equal lump-sum payments to members of {S}, the population receiving transfers, whose size at time t is $\mathrm{S}_t = \mathrm{W}_t + (p_t - 1)$. For simplicity, $\{S_t\}$ and $\{\tau_{kt}\}$ are assumed to be independent.

It is useful to define $f(K_t) = F(K_t) + (1 - \delta)K_t$, which allows us to represent m's after-tax capital income as $(1 - \tau_{kt})k_{mt} f'(K_t)$ and m's after-tax wage income as $(1 - \tau_{wt})[\, f(K_t) -$

$K_t f'(K_t)$]. Combining the two sources of income, m's total consumption is

$$c_t = \psi(k_t, \tau_t) - k_{t+1} \tag{A4}$$

with $\tau_t = \{\tau_{wt}, \tau_{kt}\}$ and $\psi(k_t, \tau_t) = (1 - \tau_{wt}) f(K_t) - [(1 - \tau_{wt})K_t - (1 - \tau_{kt})k_t] f'(K_t)$. Observe that in equilibrium, both individual capital holdings and investments are identical for all members of {M}, so individual and per capita measures are the same.

Having addressed point 1, a model for determining economic interests, we turn to point 2, the problem of reconciling economic and political dynamics. We assume that two parties, D and R, compete in regular elections and differ only regarding their capital income tax policy.[11] Their tax policies are, respectively, ${\tau_k^D}_{t+s} > \tau_{kt} > {\tau_k^R}_{t+s}$, where s = 1, 2, 3, 4 and t is an election year: D increases the tax rate; R reduces it.[12] Elections are intrinsically uncertain, say, due to shocks to voter turnout. Thus the evolution of tax policy is described by the transition probabilities $\pi(L_{t+1} \mid L_t)$, $\pi(R_{t+1} \mid L_t)$,$\pi(R_{t+1} \mid R_t)$, and $\pi(L_{t+1} \mid R_t)$. Given these transition functions, elections can be understood as adding a "seasonal" policy-induced shock to the capital income tax. The impact of this shock, we assume, dissipates in 4 years (an assumption broadly consistent with the data analysis). In any nonelection year t,$\pi(L_{t+1}|L_t) = \pi(R_{t+1}|R_t) = 1$. Election-year expectations, in contrast, presuppose a model of election outcomes to calculate next-period probabilities. Since voting preferences involve consumption comparisons conditional on electoral results, this model can remain implicit until needed in the empirical analysis. But voters form rational point expectations about the evolution of taxes based on a model of past party behavior (as detailed in Section 4) and each voter resolves ties in expected utility by a coin toss. Finally, each of the two sets of policies, $\{{\tau_k^D}_t, \tau_{wt}\}$ and $\{{\tau_k^R}_t, \tau_{wt}\}$, is assumed to be jointly and identically lognormally distributed within an administration. To proceed further with point 2, we need to solve the model.

In effect, each member of {M} solves the following stochastic dynamic programming problem (see Stokey and Lucas, with Prescott, 1989):

$$V(K, k, \tau) = \max_{k'}\{U[\psi(k, \tau) - k'] + \beta E V(K', k', \tau')\} \tag{A5}$$

for $0 \leq k' \leq \psi(k, \tau)$ and subject to (A3) and (A4). The function V is the value of m's solution from the relevant period forward; primes attached to variables denote next-period values; τ, K, τ', and K' are taken to be exogenous; and τ and K are known to m when making savings decisions. The derivation of m's plan for optimal consumption is in the spirit of Stokey and Lucas, with Prescott (1989, pp. 547–554). To begin, note that $\lim_{c\to 0} U'(c) = \infty$, $f(0) > 0$, $f''(k) < 0 < f'(k)$, so $f(k)$ is concave, and $\lim_{k\to 0} f'(k) = \infty$. Also, there is a $k^0 > 0$ such that $\psi(k) - k$ is strictly positive for $k \in (0, k^0)$ and strictly negative for $k \in (k^0, \infty)$. That is, k^0, the maximum sustainable capital, is consistent with positive consumption when capital is smaller but positive. For setting $\psi(k, \tau) - k \equiv \phi(k)$, we have $\phi(0) > 0$. And initially $\phi'(k) = (1 - \tau_k) f'(k) - 1 > 0$ for small k and any α and τ_k which are proper fractions, since $f'(k) - 1/k^{1-\alpha} + (1 - \delta)$, bearing in mind that the differentiation takes $f'(k)$ in $\phi(k)$ as fixed since k, though equal to individual capital, represents aggregate capital.

[11] Of course tax policy is at least two-dimensional, encompassing both capital and labor income. A regression of the labor income tax on a Democratic partisan dummy and other variables, parallel to the one reported in Table 1, yields a slightly positive but statistically insignificant relation at the 0.1 level.

[12] Strictly speaking, periods in the political component of the model index years, whereas the economic component of the model is a much higher frequency process.

With these facts in hand, it is legitimate to take the first-order and envelope conditions for (A5) with respect to k' and k, respectively:

$$U'[\psi(k, K, \tau) - k'] = \beta E V_{k'}(k', K', \tau') \tag{A6}$$

$$V_k(k, K, \tau) = \psi_k(k, K, \tau) U'[\psi(k, K, \tau) - k'] \tag{A7}$$

We generate a solution by advancing (A7) one period, that is, applying the operator L^{-1} to both sides, where $L^k x_t = x_{t-k}$, and taking expectations gives

$$E V_{k'}(k', K', \tau') = E[\psi_{k'}(k', K', \tau') U'(c')] \tag{A8}$$

Using (A6) and (A7) to substitute out for $E V_{k'}(k')$ and rearranging yields

$$U'(c) - \beta E[\psi_{k'}(k', K', \tau') U'(c')] = 0 \tag{A9}$$

This second-order difference equation in k_t characterizes a necessary and sufficient condition for optimal consumption by m. Strictly speaking, however, the impact of distortionary taxes means that an individual decision about k cannot be equated with a decision about K. To prove that (A9) is a solution for the economy, consider the continuous savings function $g(k)$, $k' = g(k)$, implicit in (A9). With expectation well defined by the transition function π_{ij}, Brouwer's Fixed Point Theorem implies that $g(k)$ has a fixed point k^*, and since $f(k)$ is concave, $f(0) > 0$, and $\lim_{k \to 0} f'(k) = \infty$, k^* is unique.

At the end of the fourth year of an administration, uncertainty about the identity of the next incumbent is resolved and an analysis of steady-state behavior can focus on investment policy within a given tax regime. Accordingly, the expectation operator now applies only to the comparative statics relating τ_k and w's wage and transfer income. Since $\{\tau_{kt}, \tau_{wt}\}$ is distributed lognormally with constant intraadministration variance, the expectation operator can be moved within the utility function since (e.g., Mood et al. 1974, p. 541) for a lognormal random variable X, $\ln E(X) \approx E(\ln X) + (1/2)\text{var}(\ln X)$, the last term dropping out during differentiation. In short, in the intraadministrative steady state $U(c) = EU(c')$. Therefore k^* is defined by $1 = \beta \psi_{k^*}(k^*, \tau) = \beta E(1 - \tau_k') F'(k^*)$. Solving for k^* yields

$$k^* = \left[[\alpha\beta(1 - E\tau_k')]^{-1} - \frac{1 - \delta}{\alpha} \right]^{\frac{-1}{1-\alpha}} \tag{A10}$$

where, in equilibrium, k designates both aggregate and per capita capital. A straightforward comparative statistics analysis taking linear approximations around this steady state shows that $\partial k^* / \partial E\tau_k' < 0$. Expected capital tax increases lower savings.

Using (A10) to determine $\partial k^* / \partial E\tau_k'$, the change in w's steady-state after-tax wage income, $E(1 - \tau_w')[f(K^*) - K^* f'(K^*)]$, with respect to $E\tau_k'$—the Wage Effect (WE)—is

$$-\frac{(1 - E\tau_w') k^{*\alpha-1}}{\beta(1 - E\tau_k')^2} \left[\frac{1}{\alpha\beta(1 - E\tau_k')} - \frac{1 - \delta}{\alpha} \right]^{\frac{\alpha-2}{1-\alpha}} \tag{WE}$$

which is negative. Therefore, w's wage is reduced by increases in $E\tau_k'$. Similarly, since the rental rate on capital is $\alpha k^{*\alpha-1}$, the change in w's expected transfer income relative to an expected change in the tax on capital income, $\partial(E S'^{-1} \tau_k' \alpha K^{*\alpha-1} k^*) / \partial E\tau_k'$—the Transfer

Effect (TE)—is

$$ES'^{-1}\left\{\alpha k^{*\alpha}-\frac{\alpha E\tau_k k^{*\alpha-1}}{\beta(1-E\tau_k')^2}\left[\frac{1}{\alpha\beta(1-E\tau_k')}-\frac{1-\delta}{\alpha}\right]^{\frac{\alpha-2}{1-\alpha}}\right\} \qquad (TE)$$

The sum of these two expressions, (WE) and (TE), produces a criterion—call it C—for determining whether a member of the working class prefers a higher or lower tax on capital income:

$$C = WE + TE$$

When C is positive, members of the class prefer a higher tax, and when C is negative , they prefer a lower tax. Fortunately, the RHS can be simplified: dividing by $k^{*\alpha-1}$, substituting for k^* using (A10), algebraic manipulation, and defining $\beta^* \equiv (1-\delta)\beta$ yields

$$C \equiv 1-(1+\alpha)E\tau_k'-\beta^*(1-E\tau_k')^2-ES'(1-E\tau_w')$$

As we note in the text, $C<0$ for the sample period. Most important, while members of the working class have quadratic preferences over the tax, for the sample period C decreases monotonically with increases in $E\tau_k'$.

In the text we develop a statistical analysis of C based on probit. The usual rationalization of probit requires utility to be linear in the independent variables, here, expectations of S', τ_k', and τ_w'. But obviously C is nonlinear. Accordingly we take a log-linear approximation.[13] While Taylor-series approximation is clearly the most popular approach, and there are more esoteric yet perhaps more accurate methods, we use a very direct technique outlined by Uhlig (1999). We approximate C by substituting for each variable X, $X=\bar{X}e^x$, where $x=\ln(X)-\ln(\bar{X})$, $e^x\approx 1+x$, $xy\approx 0$ (with y defined analogously to x), and $\bar{X}$ is the steady-state value of X, making $100x$ X's (small) percentage deviation from that value. Therefore, using parameters already defined and reinterpreting variables as deviations from the steady state, C becomes

$$-\left(1+\alpha-2\beta^*+2\beta^*\bar{\tau}_k\right)_{\bar{T}_k}E(\ln\tau_k')-(1-\bar{T}_w)\bar{S}E(\ln S')+\bar{S}\bar{\tau}_w E(\ln\tau_w') \qquad (C')$$

up to a constant (the constant terms dropped during this linearization are incorporated in the constant b_0 of the probit model). The new test criterion, then, is that workers prefer the Democratic tax policy if C' is positive.

Note that steady states do not just serve as the foundation for calculating the solutions of the model and the log approximation of its critical implication. Taking up the challenge posed by point 2 in the Introduction (Section 1), we also use steady states to reconcile the difference between the frequency of presidential election cycles and the higher frequency of economic processes. Specifically, we model the economy as reaching an intraelection equilibrium relative to which tax shocks occur.

[13]The utility function is nonlinear. But with x denoting the marginal rate of change in consumption due to a tax change, the agent's new utility is $\ln[c(1+x)]=\ln(c)+\ln(1+x)\approx \ln(c)+x$. So a comparison between a change by the Democrat, x_D, and a change by the Republican, x_R, is determined by $\ln(c)+x_D-[\ln(c)+x_R]=x_D-x_R$.

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