

Macro-Economic Voting: Local Information and Micro-Perceptions of the Macro-Economy*

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Abstract

We develop an incomplete-information theory of economic voting, where voters' information about macro-economic performance is determined by the economic conditions of people similar to themselves. Our theory shows that sociotropic voting is consistent with self-interested behavior. We test our theory using both cross-sectional and time-series survey data. A novel survey instrument that asks respondents their numerical assessment of the unemployment rate confirms that individuals' economic information responds to the economic conditions of people similar to themselves. Further, these assessments associate with individuals' vote choices. We also show in time-series data that state unemployment robustly correlates with evaluations of national economic conditions and presidential support.

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One of the most robust relationships in political science is economic voting: the positive correlation between an area's economic performance and the performance of incumbent politicians and parties.¹ However, no consensus exists about the micro foundations underlying this relationship. Survey data show that vote choice is more strongly associated with voter assessments of national economic conditions than with assessments of personal economic conditions. This pattern is called sociotropic voting (Kinder and Kiewiet, 1981; Kiewiet, 1983; Lewis-Beck, 1988), and is often interpreted as evidence that voters have other-regarding preferences (see, e.g. Lewin, 1991; Kiewiet and Lewis-Beck, 2011). This conclusion contrasts sharply with almost all political economy models, which assume that voters are purely self-interested, and care only about their own economic well-being (Meltzer and Richard, 1981; Persson and Tabellini, 2000).

We show that focusing on voters' imperfect information about the economy eases this tension between the political behavior and political economy literatures. A voter's economic well-being is a noisy measure of the incumbent government's policies. Thus, information about others' economic fortunes improves voters' assessments about which candidate or party is better for their own economic well-being (Kinder and Kiewiet, 1981). We therefore hypothesize that voters' perceptions of the aggregate economy are shaped by the economic circumstances of people similar to themselves, and that these perceptions influence their votes. This hypothesis is then subjected to a number of tests.

This hypothesis, which we call *mecono-economic voting*, is formalized starting with the assumption that voters gather information to understand their own economic risk, rather than to inform vote choice (Downs, 1957; Popkin, 1991). Each voter is a member of several groups, defined by location, industry, race, age, gender, etc. Following some economists, we refer to these groups as individuals' *mecono-economies*, so called because they are somewhere between the *macro-* and *micro-*economy.² Members of these groups are similarly affected

¹The literature on economic voting is truly massive. For recent reviews of the literature see Lewis-Beck and Paldam (2000) and Hibbs (2006).

²Kiewiet and Lewis-Beck (2011, p. 314) explain the term *mecono-economy* as, “[S]patially, phenomenologically, and linguistically located between the micro-economy of the individual and macro-economy of the

by economic circumstances, and thus the economic policies of the incumbent government. As the economic information most useful for understanding economic risk is information from a voter's mecro-economy, this information will shape both perceptions of the aggregate economy and vote choice.

The model establishes that self-interested voters engage in sociotropic voting. However, even if voters are other-regarding, but have easier access to mecro-economic information, they would have the same perceptions, and make the same vote choices, as self-interested voters. Thus, the predictions of the mecro-economic voting model hold independently of assumptions about voter preferences.

We test each the mecro-economic voting model in two types of data. First, we examine individual economic perceptions of the aggregate economy, and show that these reflect mecro-economic patterns. Moreover, vote choice reflects economic perceptions. Second, we show that these results are robust in aggregate, time-series data.

Our theory predicts that perceptions of aggregate economic performance will reflect mecro-economic conditions. Testing this prediction is difficult as most survey questions, like the retrospective economic evaluation on the American National Election Survey (ANES), confound individuals' information about economic performance with their judgement about how good or bad that performance is. Thus, we develop a novel survey instrument on the 2008 Cooperative Congressional Election Survey (CCES) that asks respondents to report their perception of the national unemployment rate and gas prices.³

In accordance with theory, we find that individuals who are more likely to be unemployed (but are employed), report higher national unemployment rates. Specifically, women, African-Americans, low-income workers, and individuals from states with higher unemployment rates all report higher rates of *national* unemployment. These reported unemployment rates associate with vote choice, even when controlling for numerous other factors.

country as a whole.”

³This follows Alvarez and Brehm (2002) in focusing on hard information when assessing the information sets of respondents, which may better isolate variation in reported economic evaluations that are rooted in differences in actual economic information (Ansolabehere, Meredith and Snowberg, 2011).

Additionally, our theory predicts that perceptions of aggregate economic conditions will be more homogeneous among individuals that actually receive information about the aggregate economy. As the national unemployment rate is often reported in national news, we predict that people who watch national news will report more homogenous assessment of aggregate economic conditions than those who do not. In contrast, as gas prices are directly observable, we predict that perceptions of gas prices will be similar among those who do and do not watch national news. These predictions are empirically supported.

Our second set of empirical results implement similar tests in panel data to address concerns that the results from the CCES are due simply to omitted variables. In particular, controlling for unobserved, persistent, heterogeneity, and national trends, we show that local economic conditions affect responses to both the national and personal retrospective economic evaluations on the ANES. We then construct a monthly time-series of state-level presidential approval from Gallup from 1981 to 2008, and show that presidential approval is also lower in areas where the economy is performing poorly.

Before turning to an overview of relevant literature, it is important to note that many of elements of our theory are not new. Downs (1957) and Popkin (1991) develop the idea that voters are imperfectly informed and vote based on information gathered for other purposes. Kinder and Kiewiet (1981) suggest that national economic conditions may be a better signal of the incumbent's effects on an individual's future economic well-being than personal economic circumstances. Kiewiet (1983) emphasizes that much economic information likely comes from a voter's friends and neighbors. Weatherford (1983*b*) notes that local economic conditions may affect perceptions of national economic conditions. What is novel here is the attempt to synthesize these elements into a coherent theory, draw new testable implications, and examine these implications both in new data, and new analyses of old data. While the evidence we offer here is not exhaustive, it is suggestive of a new approach for studying the political economy of voting.

1.1 Relation to the Literature

The literature on economic voting is vast, and as our theory synthesizes several extant concepts it has ties to many of the sub-literatures. Here we do our best to make those ties explicit. This paper contributes to the general literature on economic voting by providing a theory of how voters acquire economic information, and use this information in vote choice. It contributes to the literature on heterogeneity in economic evaluations by drawing attention to the distinction between economic information and the judgment of that information in forming economic evaluations, and documenting new empirical facts about economic information. As our work does not contribute to understanding heterogeneity in economic judgments, it is a natural complement to recent work on how individuals' attribute economic performance to politicians. Finally, it builds on work that investigates how local economic conditions relate to voters' economic assessments and political preferences.

Economic Voting. Since Kramer's (1983) influential critique, research on economic voting has largely been split between work that considers variations in aggregate, time-series data, and that which considers individual, cross-sectional data. Most aggregate studies relate time-series variation in aggregate economic measures to time-series variation in political support. These economic measures can either be objective measures of economic performance like economic growth or the unemployment rate (for example: Kramer, 1971), or aggregated subjective economic evaluations (for example: MacKuen, Erikson and Stimson, 1992; Erikson, MacKuen and Stimson, 2002). This contrasts with individual-level studies that relate cross-sectional variation in economic evaluations with political preferences (Lewis-Beck, 1988; Duch and Stevenson, 2008).

Kramer (1983) asserts that much of the cross-sectional variation in economic evaluations is driven by extraneous factors.⁴ However, as our theory suggests that some cross-sectional

⁴Van der Brug, van der Eijk and Franklin (2007, pp. 195–196) build on this critique and conclude, “Studies estimating the effects of subjective evaluations cannot be taken seriously as proper estimates of the effects of economic conditions.”

variation is driven by actual differences in economic information, ignoring it is costly. For example, in our theory, informational differences may lead one voter to support the incumbent because he or she perceives the economy is performing well, while another voter, in the same election, supports the challenger because he or she perceives the economy is performing poorly.⁵ Both votes are identified as economically based in cross-sectional data, but cancel each other out in aggregate data.

Heterogeneity in Economic Evaluations. Theories of economic voting require that individuals form perceptions of the economy, and then judge those perceptions, in the process of forming economic evaluations. The retrospective economic evaluation, the modal source of cross-sectional data, confounds perceptions and judgments. That is, heterogeneity in retrospective economic evaluations may result either because voters have different information about economic conditions, or because voters differ in how they judge these perceived economic conditions.

Macro-economic voting theory predicts that differences in the economic information that is relevant and available will lead to heterogeneity in individuals' perceptions of the aggregate economy. Therefore, rather than ask for an evaluation of the unemployment situation, we directly elicit information about unemployment.⁶ This is related to the substantial literature examining heterogeneity in economic evaluations, although we focus on perceptions rather than evaluations.⁷

Our work also relates to a small literature that examines how different groups respond to economic information across time. Hopkins (In Press) shows that stock-market returns

⁵The results in Hetherington (1996) suggest this may have occurred in the 1992 presidential election.

⁶Ansola-behere, Meredith and Snowberg (2010) details the construction of questions that ask about numeric quantities, like the unemployment rate, and how these questions can be used to ascertain whether partisanship affects economic perceptions, judgments, or reporting.

⁷See Kiewiet (1983); Weatherford (1983*a,b*); Conover, Feldman and Knight (1986); Kinder, Adams and Gronke (1989); Mutz (1992*b*, 1993, 1994); Hetherington (1996); Holbrook and Garand (1996); Wlezien, Franklin and Twiggs (1997); Anderson, Duch and Palmer (2000); Palmer and Duch (2001); Duch and Palmer (2002); Anderson, Mendes and Tverdova (2004); Evans and Andersen (2006); Duch and Stevenson (2008); Evans and Pickup (2010); Reeves and Gimpel (In Press) for some notable examples. These studies find observables such as gender, race, partisanship, and education often significantly associate with economic evaluations in a cross-section.

affect the economic expectations of high income earners more than low income earners. Similarly, Krause (1997) finds that economic news only affects the economic expectations of those with a college education. In contrast, Haller and Norpoth (1997) finds no difference in economic information between those who do and do not consume news. None of this work links differences in groups' economic information to support for the incumbent.

Attributional Theories. Recent theorizing on economic voting, inspired by classic work on the asymmetric impacts of good versus bad economic news, focuses on heterogeneity in voters' judgments of economic conditions, rather than differences in information (Bloom and Price, 1975; Rudolph, 2003). These attributional theories are largely complementary to ours: we focus on issues purposefully ignored by attributional theories, and vice-versa.

In particular, Gomez and Wilson (2001, 2003, 2006) find that politically unsophisticated voters use sociotropic evaluations, whereas politically sophisticated voters rely on pocketbook evaluations. This work largely assumes that voters have similar information, but make judgments using different criteria. Another strand of this literature focuses on the media's role in helping individuals translate information into political preferences (Mutz, 1992*a*, 1994). Adding different evaluative criteria for different voters would be straight-forward in our framework—we refrain from doing so only because it produces no insights beyond those already in the literature.

Finally, as, in our model, individuals are motivated to collect information to understand their economic risk, there is a connection with the substantial literature on how economic risk affects attitudes towards trade policy and redistribution (see Scheve and Slaughter, 2004, 2006; Rehm, 2009, 2011, for recent examples).

Local Economic Conditions. A small literature examines the relationship between local economic conditions and aggregate economic evaluations (Weatherford, 1983*b*; Books and Prysby, 1999; Reeves and Gimpel, In Press). These studies generally find that evaluations of the aggregate economy are more favorable in areas where local economic conditions are

better. However, such cross-sectional studies may suffer from omitted variable bias.

A more sizable literature examines how local economic conditions relate to presidential vote shares. Like the studies mentioned above, these too may suffer from omitted variable bias. Indeed, this may be why such studies produce inconsistent results across elections. For example Brunk and Gough (1983) find that Carter did better in states with *higher* unemployment, whereas Abrams and Butkiewicz (1995) conclude that Bush performed better in 1992 in states with *lower* unemployment.⁸ Two studies use panel data to investigate the influence of local economic conditions on presidential vote shares across a broader set of elections (Strumpf and Phillippe, 1999; Eisenberg and Ketcham, 2004). Both find effects of local per-capita income growth on presidential vote shares that are an order of magnitude smaller than national changes. Neither finds an effect of local unemployment.

We build on this literature in a number of ways. By constructing a panel of retrospective economic evaluations, we can control for unobserved, persistent, heterogeneity in economic evaluations across different locations. This reduces concerns about omitted variable bias. Moreover, we construct a monthly, 28-year-long panel of presidential approval by state that gives us substantially greater statistical power than previous work. This allows us to uncover an effect of local unemployment, in contrast to the findings of Strumpf and Phillippe (1999) and Eisenberg and Ketcham (2004). Moreover, our estimate of the relative of the importance of local unemployment is twice as large as the estimated effect of local income growth in these two studies.

2 Theory

Our theory starts from the observation that the economy is not monolithic: there are different sectors of the economy, and different professions within a given sector that may have different fortunes over the same time period. These trends are somewhere between the micro- and

⁸Wright (1974); Abrams (1980); Achen and Bartels (2005) also examine how local economic conditions relate to changes in vote share. A related literature looks at the effect state economic performance on gubernatorial popularity and votes (for example: Hansen, 1999; Wolfers, 2002; Cohen and King, 2004).

the macro-economy, a space economists sometimes refer to as the mecro-economy. We also assume that voters are self-interested: they vote based on their own economic circumstances.

We then adopt a particularly simple formulation for political information and behavior. Specifically, as a by-product of economic planning, individuals also obtain information on the effect of the incumbents' policies (Popkin, 1991). This information causes them to update their beliefs about whether the incumbent's policies are good or bad for them. Individuals compare their ex-post belief to a common baseline, and vote for the incumbent if their ex-post belief is greater than the baseline. Otherwise they vote for the opposition.

Individuals invest in economic information to the extent it increases their own utility. In the case of unemployment, individuals gather information about others' employment status to gain information about their own future income.⁹ As shown formally in the appendix, holding costs equal, an individual prefers signals of current employment conditions that are more directly related to his own *personal unemployment rate*—that is, the probability he will become unemployed. However, there is a tradeoff between sampling variance and sampling bias. At one extreme is an individual's own unemployment status, which measures an individual's exact quantity of interest—their own probability of being unemployed under the incumbent—but with a small sample size that results in a large amount of sampling variance. At the other extreme is the national unemployment rate, which is drawn from a large enough sample to essentially eliminate sampling variance, but pools an individual's personal unemployment rate with the rates of everyone else.

An individual prefers information from their mecro-economy. This information has lower

⁹We focus throughout on unemployment because it is important for economic voting, is directly experienced by individuals, and varies markedly, and measurably, between groups. In high quality datasets, unemployment is the strongest predictor of election outcomes in the U.S. (Kiewiet and Udell, 1998). Further, employment and unemployment are directly experienced by individuals, their friends, and their neighbors. Indeed, it is likely easier to observe whether or not your neighbor is employed, which is informative of unemployment, than it is to gauge the size of a raise he or she may or may not have received, which is informative of economic growth. Finally, unlike economic growth, unemployment is often tabulated by demographic group, allowing us to directly test whether groups that experience higher rates of unemployment have systematically different economic perceptions and political preferences. As noted in the Appendix, it is straight-forward to extend the theory to cover more continuous indicators such as personal income and economic growth.

sampling variance than personal information, and lower sampling bias than national information. Moreover, information about an individual's mecro-economy is essentially free. Local information arrises as a by-product of an individual's everyday interactions in his or her home, neighborhood, and workplace.

Together, the above implies that individuals will have different information, and hence perceptions, about the state of the economy that will, on average, reflect the situation in an individual's mecro-economies. These differing perceptions will lead to different vote choices. For example, if members of an individual's family, neighborhood, profession and other social circles all have jobs, he will conclude that his personal unemployment rate is low under the incumbent, and vote to retain her. In contrast, if many members of an individual's family, neighborhood, profession and other social circles are jobless, he will conclude that his personal unemployment rate is high under the incumbent, and vote for the opposition.

Note that the same predictions would hold if voters had other-regarding preferences: that is, if they wanted to vote for the candidate that is best for the aggregate economy. Unless other-regarding voters expend costly effort to become fully informed about the state of the aggregate economy, voters will still have heterogenous information that will relate to their own economic circumstances. Thus, observing that individuals' own economic circumstances relate to voting behavior is not necessarily evidence of self-interested voting. However, we maintain the assumption of self-interest to show that it is consistent with sociotropic voting.

3 A Prediction: Sociotropic Voting

Here we show that our theory produces patterns that resemble the empirical regularity of sociotropic voting: individuals vote largely on the basis of general, rather than personal, economic conditions. This result may seem counter-intuitive, as our theory centers on voting based on the effect of the incumbent on an individual's personal unemployment rate. However, this result follows from the fact that general trends provide more information about an

individual's personal unemployment rate and an individual's current employment status. This section sketches an argument that is formalized in the appendix.

Consider an individual who is planning for the next year, and will use information he gathers in the course of economic planning to inform his vote. Under standard assumptions, individuals will want to save against the possibility of becoming unemployed in the future. In order to appropriately save, individuals gather information to estimate their personal unemployment rate, that is, the probability they will become unemployed the following year. To the extent that this personal unemployment rate is tied to the incumbent's economic policies, this information will also be useful in deciding for whom to vote.

In the tradition of citizen-candidate models (Osborne and Slivinski, 1996; Besley and Coate, 1997), the policies of both the incumbent and challenger are fixed and known. In accordance with the findings in Alvarez and Brehm (2002), the effects of those policies on an individual's personal unemployment rate are unknown. Thus, current economic information is useful to an individual trying to infer his personal unemployment rate under the incumbent. For concreteness, assume that an individual can have a personal unemployment rate that is either 10% (high) or 5% (low), which is the same as the rate in his macro-economy. Suppose further that before a politician is elected, there is a 50% chance that her economic policies will cause the individual to have a low personal unemployment rate.

In the model, there are two potential sources of information about an individual's personal unemployment rate: his current employment status, and the national unemployment rate. Someone who is employed believes there is only a 51% chance that the incumbent's policies resulted in a low personal unemployment rate. Thus, employment status is a very weak signal of the effect of the incumbent's policies.

If the national unemployment rate is correlated with an individual's personal and macro-economic unemployment rate, the national unemployment rate also provides a noisy signal about an individual's personal unemployment rate. Indeed, as shown in the appendix, this correlation needs only be very slight for it to be a better signal of a voter's personal unem-

ployment rate. Indeed, high national unemployment will cause an employed voter to vote against the incumbent if the national unemployment rate is correlated only 0.03 with the voter's mecro-economic unemployment rate.

Thus, self-interested voters will vote sociotropically—their evaluations of general economic trends will be more predictive of vote choice than reports of personal economic circumstances. This occurs because aggregate information is a powerful signal of whether or not the incumbent's economic policies are good for the individual.

In keeping with our argument above that mecro-economic information is the most useful, and freely available form of information, we could instead allow individuals to observe a perfect signal of the unemployment rate in their mecro-economies. Voters' perceptions of the macro-economy would then be determined by information about their mecro-economy. Moreover, voters would then vote on the basis of information about their mecro-economy, however, as this is correlated with the national economy it will *appear* that they are voting based on national, rather than personal, economic conditions. This motivates the empirical tests in the next section, which examine whether individuals who are part of mecro-economies with more unemployment perceive that the unemployment rate is higher.

4 Cross-sectional Evidence

The results in this section are concerned with individuals' perceptions of the national unemployment rate. However, before turning to these results, we must fill in the step between individuals' perceptions of their *mecro*-economy and those of the *macro*-economy.

As local information is more relevant to economic planning and less costly to gather, mecro-economic voting predicts that much of the information a voter has is from their mecro-economy. Because local and national conditions are positively correlated, we expect that individuals observing worse local conditions will rationally perceive that the national economy is worse. As a result, those observing higher local unemployment will report higher

national unemployment rates.¹⁰ Of course, many people know the national unemployment rate, and this knowledge will vary with an individual's media environment. Thus, in Section 4.2 we use variation in exposure to media as a further test of mecro-economic voting theory.¹¹

4.1 Unemployment Perceptions

The results discussed in this section concern the following question asked of 3000 respondents to the 2008 Cooperative Congressional Election Survey (CCES):

The unemployment rate in the U.S. has varied between 2.5% and 10.8% between 1948 and today. The average unemployment rate during that time was 5.8%.

As far as you know, what is the current rate of unemployment? That is, of the adults in the US who wanted to work during the second week of October, what percent of them would you guess were unemployed and looking for a job?

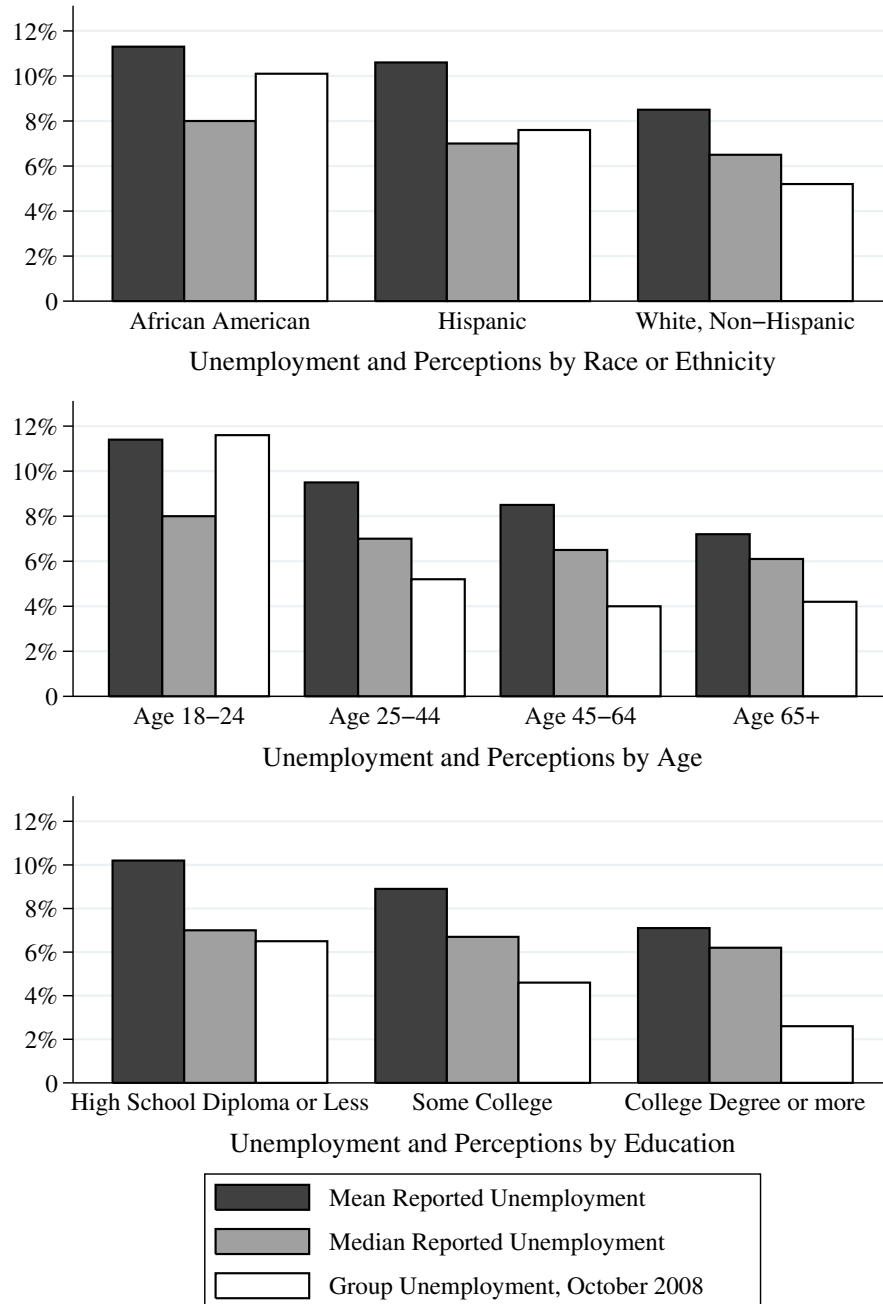
Figure 1 displays the general pattern in the data: groups that experience more unemployment report, on average, higher unemployment rates. This is true whether the average is measured according to the median or mean.¹² However, one might worry that these assessments are driven by other factors. For example, perhaps younger people are more liberal, and the more liberal a person is, the higher he or she perceives unemployment to be. While it is unlikely that we could establish a causal relationship between a person's mecro-economic environment and his or her assessments of unemployment rates, we can certainly control for observable correlates in more complete regression analyses.

¹⁰This behavior is similar to the anchoring or availability bias documented in Kahneman and Tversky (1974) but is also consistent with the bayesian model used in the appendix.

¹¹The idea that individuals have different costs of learning information is reflected in many public opinion studies, for example: Alvarez and Franklin (1994); Alvarez (1997); Bartels (1986); Luskin (1987); Zaller (1992); and Zaller and Feldman (1992). Moreover, about half of the U.S. public admits to not getting any economic news (Haller and Norpoth, 1997).

¹²In order to prevent unusually high responses from driving differences in the mean, we top code responses at 25% throughout. This affects 6.3% of respondents. Top coding at 15% through 50% (or just dropping observations over that level) produces qualitatively similar results. In general, the greater the value at which top coding begins, the more pronounced the differences between groups.

Figure 1: Reported unemployment rates increase as the true unemployment rate of a group increases.



Notes: Reported unemployment is top-coded at 25% in order to reduce the influence of outliers in the means.

Table 1 presents exactly these analyses. Unfortunately, we could not control for employment sector, as the CCES does not contain such data. Columns 1 and 3 contain a least absolute difference (LAD) specification, often referred to as a median regression. The coefficient on an attribute can be seen as the difference between the median reported unemployment rate for respondents with that attribute and a baseline, controlling for observable characteristics. Columns 2 and 4 contain OLS specifications. The coefficient on an attribute can be seen as the difference between the mean reported unemployment rate for respondents with that attribute and a baseline, controlling for observable characteristics. Consistent with Figure 1, the OLS coefficients (differences between means, by group) are greater than the LAD coefficients (differences between medians, by group).

The coefficients in Table 1 generally agree with the patterns in Figure 1: groups that experience more unemployment report, on average, higher unemployment rates. This can be seen by comparing the coefficients in Table 1 with Table 2, which contains unemployment data from the Bureau of Labor Statistics (BLS) for October, 2008. However, there are two notable deviations: even though both women and married men had lower unemployment rates than unmarried men, they perceive higher unemployment rates.

Women may report higher unemployment rates because they participate in the labor force at a lower rate, as shown in Table 2. In most cases, groups with higher labor force non-participation are more likely to be unemployed. This is not the case for women. To the extent that the unemployment rate does not accurately reflect discouraged workers, it may be that women perceive a higher unemployment rate because their peer group includes many discouraged workers. While the BLS would view these women as being labor force non-participants, respondents may classify them as unemployed.¹³

Despite the fact that the BLS does not provide labor force participation by marital status, it seems likely that married men have a higher labor force participation rate than unmarried

¹³Note that the BLS tracks several alternative measures of unemployment, some of which try to account for discouraged and underemployed workers (especially their U-6 measure). Unfortunately, we have not found these statistics broken down by gender.

Table 1: Correlates of Reported Unemployment (CCES, N = 2,875)

Democrat	0.56*** (0.08)	1.26*** (0.22)	0.54*** (0.08)	1.22*** (0.25)
Independent	0.33*** (0.07)	0.84*** (0.20)	0.30*** (0.08)	0.76*** (0.18)
Age 18–24	0.90** (0.41)	2.45*** (0.55)	0.79*** (0.15)	2.49*** (0.55)
Age 25–44	0.52*** (0.10)	1.48*** (0.24)	0.47*** (0.09)	1.47*** (0.25)
Age 45–64	0.18*** (0.06)	0.62*** (0.20)	0.18** (0.08)	0.63*** (0.17)
Married Male	0.23** (0.10)	0.53** (0.22)	0.18* (0.09)	0.47*** (0.16)
Unmarried Female	0.72*** (0.16)	2.26*** (0.33)	0.65*** (0.10)	2.22*** (0.37)
Married Female	0.64*** (0.14)	2.10*** (0.27)	0.59*** (0.09)	2.07*** (0.20)
African American	0.58** (0.28)	1.85*** (0.40)	0.69*** (0.10)	1.93*** (0.39)
Hispanic	-0.01 (0.14)	0.96*** (0.37)	0.10 (0.11)	1.01*** (0.35)
Some College	-0.23** (0.10)	-1.15*** (0.23)	-0.25*** (0.07)	-1.15*** (0.26)
BA Degree	-0.30*** (0.08)	-1.54*** (0.21)	-0.33*** (0.08)	-1.56*** (0.26)
Income < \$20,000	0.92*** (0.30)	2.56*** (0.49)	0.80*** (0.14)	2.42*** (0.52)
\$20,000 < Income < \$40,000	0.49*** (0.15)	1.10*** (0.31)	0.42*** (0.11)	1.03*** (0.30)
\$40,000 < Income < \$80,000	0.06 (0.07)	0.41* (0.23)	0.07 (0.10)	0.35* (0.20)
\$80,000 < Income < \$120,000	0.00 (0.07)	0.13 (0.25)	0.03 (0.11)	0.12 (0.27)
Unemployed	0.20 (0.20)	1.15** (0.49)	0.14 (0.12)	1.23*** (0.45)
State Dummies	$F = 22.5$ $p = 0.00$	$F = 1.39$ $p = 0.04$		
State Unemployment Rate			0.11*** (0.02)	0.15** (0.07)
Constant	5.48*** (0.83)	5.65*** (1.13)	5.04*** (0.22)	4.41*** (0.61)
Regression Type	LAD	OLS	LAD	OLS

Notes: ***, **, * denote statistical significance at the 1%, 5% and 10% level with robust standard errors in parenthesis for OLS and bootstrapped (or block-bootstrapped) standard errors for LAD. Standard errors are clustered at the state level when state unemployment is included. Regressions also include minor and missing party, church attendance, union membership, and missing income indicators. The omitted categories are white for race, unmarried men, 65+ for age, 12 years or less of education, and \$120,000+ for income.

Table 2: Unemployment and labor force non-participation rates in 2008, by group.

	Unemployment Rate	Labor Force Non-Participation
National Average:	5.8%	34.0%
Age:		
18–24:	11.6%	31.3%
25–44:	5.2%	16.3%
45–64:	4.0%	25.6%
65+:	4.2 %	83.2%
Rate or Ethnicity:		
White:	5.2%	33.7%
Hispanic:	7.6%	31.5%
African American:	10.1%	36.3%
Education:		
High School or Less:	6.5%	42.2%
Some College:	4.6%	28.2%
College Degree and Postgraduate:	2.6%	22.2%
Gender:		
Male:	6.1%	27.0%
Female:	5.4 %	40.5%
Marital Status:		
Never Married:		
Male:	11.0%	N/A
Female:	8.5%	N/A
Married:		
Male:	3.4%	N/A
Female:	3.6%	N/A

Source: Bureau of Labor Statistics.

men. Why then do married men report higher unemployment rates than unmarried men? A potential answer comes from the literature on international political economy (IPE). IPE studies show that married men are more likely to favor protectionist trade policies, and scholars attribute this to married men having more economic anxiety.¹⁴ While anxiety about the economy may lead married men to exaggerate the unemployment rate as well

¹⁴See, for example, Hiscox (2006). We thank Stephanie Rickard for pointing this out.

as the threat of free trade, it seems more appropriate here to simply note that married men report unemployment rates inconsistent with theory.

The first pair of specifications in Table 1 differ from the second pair only in how they treat location. The first two columns contain state fixed effects, consistent with the specification for all other attributes. In both specifications, these state-by-state dummies are jointly statistically significant. However, it is possible that this correlation results from respondents in states with lower unemployment rates reporting higher unemployment rates, contrary to the predicted patterns. To examine this possibility, the second pair of columns include each state's unemployment rate, rather than state fixed effects.¹⁵ Columns 3 and 4 of Table 1 show that living in a state with a higher unemployment significantly associates with a higher reported unemployment rate. This finding, along with the finding that an individual's own unemployment status is associated with a higher reported unemployment rate, provides the most direct evidence that respondents are using information from their surroundings.

4.2 Media Use and Perceptions

Macro-economic voting specifies that differences in national economic perceptions are based on differences in information. This will be affected by differences in media use, which provides additional information such as the national unemployment rate. We leverage this fact to conduct two further tests that examine how access to information affects respondents' economic perceptions.

We expect that voters will report common assessments of national economic conditions when information about the aggregate economy is available. As national television news often reports the national unemployment rate, we expect to observe less heterogeneity in national unemployment assessments among those who report watching national television news. However, as gas prices are directly observable, we expect that heterogeneity in assess-

¹⁵Including variables that change only at a group level may bias standard errors. To mitigate this issue, we use robust standard errors clustered at the state level in the OLS specification, and standard errors block bootstrapped at the state level for the LAD specification.

ments of gas prices should be largely the same between those that do, and do not, watch national television news.

Table 3 confirms that these predicted patterns exist in the data. In particular, among those that do not watch national news, different age, educational, income, and ethnic groups show greater differences in unemployment assessments than among those that do watch national news. Such differences do not exist in perceptions of gas prices. As those who do and do not watch media are different in many ways, we cannot claim that this is a causal effect, however, it is still supportive of macro-economic voting theory.

Although assessments of gas prices do not change with media exposure, our macro-economic theory predicts that they should change with activities that provide more exposure to gas prices. Ansolabehere, Meredith and Snowberg (2010) show that, controlling for a host of demographic factors, each extra day per week a respondent drove made his or her reported perceptions 0.8 cents more accurate. Similarly, each extra day per week a respondent reported noticing gas prices induced an independent 1.6 cent increase in accuracy. To put this another way, controlling for other factors, a respondent who drove to work and noticed gas prices five days a week would be 12 cents more accurate than the average respondent. Given that the mean difference between reported and actual gas prices was about 20 cents, this implies that people who drive and notice gas prices on their way to work are 60% more accurate in their assessments of the price of gas.¹⁶

4.3 Unemployment Perceptions and Vote Choice

We expect, based on the theory in Section 2, that the higher a respondent's reported unemployment level, the more likely he or she will be to vote for the candidate from the opposition party, which was the Democrats in 2008.

We regress an indicator variable coded one if the respondent indicated he or she voted for

¹⁶Consistent with attributional theories discussed in the introduction, everyday interactions may also affect preferences: Egan and Mullin (2010) find that local weather conditions affect individuals' feelings about the importance of policies aimed at curbing global warming. However, as mentioned in the introduction, attributional theories largely ignore the role of information and perception.

Table 3: Correlates of Unemployment and Gas Prices by Media Environment

Dependent Variable: Watch National News?	Unemployment		Gas Prices	
	No N = 957	Yes N = 1,919	No N = 962	Yes N = 1,925
Democrat	0.53* (0.27)	0.53*** (0.08)	0.56 (2.93)	2.69** (1.18)
Independent	0.28 (0.28)	0.28*** (0.07)	2.67 (2.61)	2.31*** (2.00)
Age 18–24	1.87** (0.80)	0.50 (0.40)	10.5 (6.6)	8.83*** (3.42)
Age 25–44	0.74*** (0.21)	0.38*** (0.09)	-0.77 (3.93)	1.49 (2.81)
Age 45–64	0.16 (0.18)	0.12* (0.06)	-4.44 (3.57)	1.14 (1.12)
Married Male	0.24 (0.26)	0.14** (0.07)	-4.61 (3.18)	-0.72 (1.89)
Unmarried Female	0.76** (0.34)	0.49*** (0.10)	-0.16 (2.37)	2.21 (2.22)
Married Female	0.92*** (0.27)	0.44*** (0.10)	-0.31 (3.05)	1.93 (2.03)
African American	1.35** (0.62)	0.31 (0.21)	7.97* (4.84)	0.31 (2.72)
Hispanic	0.14 (0.36)	0.01 (0.12)	0.04 (3.45)	6.14*** (2.26)
Some College	-0.52** (0.26)	-0.19*** (0.07)	5.76* (3.11)	-0.28 (1.26)
BA Degree	-0.80*** (0.27)	-0.19*** (0.07)	1.35 (2.62)	3.20* (1.94)
Income < \$20,000	1.42 (1.16)	0.52*** (0.17)	-0.47 (5.94)	-0.22 (3.15)
\$20,000 < Income < \$40,000	0.71* (0.38)	0.28*** (0.08)	-3.93 (5.87)	-0.48 (2.18)
\$40,000 < Income < \$80,000	0.22 (0.22)	0.06 (0.07)	-5.03 (4.14)	-1.68 (2.07)
\$80,000 < Income < \$120,000	0.20 (0.27)	0.00 (0.08)	-5.35 (4.31)	-3.82** (2.01)
Unemployed	1.03 (1.01)	-0.02 (0.16)	8.59*** (2.90)	3.47 (4.31)
State Unemployment Rate	0.09 (0.06)	0.11*** (0.02)		

Notes: ***, **, * denote statistical significance at the 1%, 5% and 10% level. LAD specifications with block-bootstrapped standard errors, blocked at state level, in parenthesis. National Media sample indicated they watched national TV news, while local did not. Regressions also include minor and missing party, church attendance, union membership, and missing income indicators. The omitted categories are white for race, unmarried men, 65+ for age, 12 years or less of education, and \$120,000+ for income.

Table 4: Vote Choice Associates with Unemployment Assessments.

Dependent Variable: Vote for Obama = 1, Vote for McCain = 0 (CCES, N=2,026)						
Reported Unemployment	0.017*** (0.002)	0.005** (0.002)	0.003* (0.002)			
Reported Unemployment X Within Historical Range				0.06*** (0.01)	0.012** (0.006)	0.010* (0.006)
Below Historical Minimum				0.31 (0.20)	0.26 (0.20)	0.19 (0.16)
Above Historical Maximum				0.60*** (0.07)	0.13*** (0.05)	0.10** (0.04)
Constant	0.40*** (0.02)	0.03** (0.01)	0.10 (0.09)	0.11* (0.06)	-0.02 (0.03)	0.05 (0.10)
Party Identification (7 dummy variables)	No	Yes	Yes	No	Yes	Yes
All Other Controls (From Table 1)	No	No	Yes	No	No	Yes

Notes: ***, **, * denote statistical significance at the 1%, 5% and 10% level with robust standard errors in parenthesis. All specifications are implemented via OLS regressions.

Barak Obama, the Democratic candidate, and zero if he or she voted for John McCain, the Republican candidate, on reported unemployment and a host of controls in Table 4.¹⁷ Macro-economic voting predicts that the coefficient on reported unemployment will be positive.

The first column of Table 4 shows that reported unemployment is significantly correlated with vote choice. However, as shown in Table 1, unemployment assessments are correlated with partisan leanings. In order to control for this, we enter dummy variables for each point of a seven-point party identification scale in the second column. Reported unemployment is still significantly related to vote choice, but the coefficient is smaller.

What other controls should be included in the regression? According to the theory above, demographic factors are proxies for different economic experiences and local conditions, that, in turn, cause individuals to have different perceptions. However, at the same time, demographic factors may have a direct effect on voting. Thus, although including demographic

¹⁷Sample sizes are smaller as those who reported not voting were not included in the analysis.

controls will absorb much of the effect predicted by theory, they are necessary to avoid omitted variable bias. The third column of Table 1 includes all our demographic controls in the regression, and the coefficient on reported unemployment shrinks, as expected.

It is likely that respondents who reported an unemployment rate below the historical minimum or above the historical maximum—given in the survey question—were not paying close attention to the survey. Therefore, columns four through six group together respondents who reported a level of unemployment above or below the range of historical values—that is below 2.5% or above 10.8%.¹⁸ For those respondents who reported a level between 2.5% and 10.8%, reported unemployment enters the specification linearly, as in the first three columns.

We find a stronger association between reported unemployment and vote choice when we focus on only those responses within the range of historical values. In our preferred specification in column five of Table 4, a one standard-deviation change in unemployment assessment is associated with a six percentage point increase in the probability of voting for Obama, which is the same as the standard deviation of two-party vote in the postwar period.¹⁹ Thus, those respondents who believe that the unemployment rate is higher also were significantly more likely to vote against the incumbent party, as predicted.

5 Evidence from Time-Series Data

Consistent with macro-economic voting, the results in the previous section show that individuals with a higher personal unemployment rate report higher rates of national unemployment

¹⁸The reported unemployment rate of those above and below the frame is coded as zero in Table 4. We could also drop these respondents from the analysis—this produces similar results.

¹⁹Probit or logit specifications produce qualitatively similar results, but stronger support for macro-economic voting. That is, the coefficients on reported unemployment are statistically significant at greater levels, and the marginal effects of a change in perceptions are larger. We present OLS estimates as they are qualitatively similar and easier to interpret.

Up until this point, we have assumed a linear relationship between reported unemployment rate and vote choice. However, there is no particular reason to believe that the relationship should be linear. A quadratic specification gives a similar magnitude for the relationship between reported unemployment and vote choice, and is statistically significant at the 95% level when including additional controls such as ideology. Regressing unemployment on dummy variables for each percent of reported unemployment (24 dummy variables) and running a joint F-test produces a generally increasing likelihood of voting for Obama as reported unemployment increases, and the coefficients are jointly significant at $p = 0.0000$.

in 2008. However, other, unobserved, factors may be driving this relationship. For example, individuals who live in states with high unemployment in 2008 might be systematically different in some unmeasured way than individuals who live in states with low unemployment. To overcome this potential issue we examine how changes in local conditions relate to changes in evaluations of the aggregate economy and the incumbent, controlling for both national trends and unobserved, persistent, characteristics.

To link our analysis in this section with the analysis in previous section, we examine how state unemployment rates associate with retrospective economic evaluations and presidential approval within a state. We focus on states for both theoretical and practical reasons. From a theoretical prospective, monthly state unemployment rates are reported by the Bureau of Labor Statistics, and widely disseminated by the media, making them an easily available piece of macro-economic information. From a practical prospective, state is the only geographic variable consistently reported in all of the data sources we use. There are also disadvantages to focusing on states, as state unemployment may be less correlated with a voter's personal unemployment rate than more disaggregated information (see Reeves and Gimpel, In Press). This will create measurement error, making it more difficult for us to find an effect of state unemployment on economic evaluations and presidential support.

We first examine how state unemployment relates to the standard national retrospective economic evaluation from the ANES, which asks:

Now thinking about the economy in the country as a whole, would you say that over the past year the nation's economy has gotten much better, somewhat better, stayed about the same, somewhat worse, or much worse?

This question was asked from 1980 to 2008, with the exception of 2006.²⁰

Macro-economic voting theory predicts that respondents in states with higher unemployment rates, or states where unemployment increased dramatically in the past 12 months,

²⁰The 2006 ANES used a 3 point scale, rather than a 5 point scale, and hence, is not directly comparable. In order to maintain consistency with Section 4 we would prefer to also be able to examine unemployment evaluations across time. However, data on unemployment evaluations is extremely limited.

Table 5: State unemployment is correlated with national retrospective economic evaluations, even when controlling for national trends.

Dependent Variable:	Average National Retrospective Economic Evaluation in State (ANES)			Average Personal Retrospective Economic Evaluation in State (ANES)		
	(1 = Much Worse, 5 = Much Better)					
State Unemployment Rate	-0.020*** (0.006)	-0.015** (0.006)	-0.034*** (0.012)	-0.033** (0.013)	-0.036*** (0.011)	-0.068*** (0.018)
Δ State Unemployment Rate	-0.033 (0.022)	-0.059*** (0.008)	-0.050*** (0.010)	-0.057** (0.020)	-0.042* (0.021)	-0.026 (0.023)
National Unemployment Rate	-0.046 (0.087)			-0.012 (0.033)		
Δ National Unemployment Rate	-0.27*** (0.060)			-0.11* (0.052)		
Constant	2.96*** (0.63)	1.99*** (0.05)	2.17*** (0.08)	-2.56*** (0.25)	-2.86*** (0.092)	-2.52*** (0.13)
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
State Fixed Effects	No	No	Yes	No	No	Yes

Notes: ***, **, * denote statistical significance at the 1%, 5% and 10% level with robust standard errors clustered by year in column 1 and 4, state in columns 2, 3, 5, 6. Each regression implemented via OLS regressions with 497 state x year observations. Personal retrospective economic evaluations are measured on a 3-point scale, for comparability with national retrospective evaluations, we re-scale this to a 5-point scale.

will report relatively worse national retrospective evaluations than respondents in states with low levels of unemployment. Table 5 shows this is the case. The first column indicates that the most important correlate of differences in national retrospective economic evaluations across time is the previous year's change in the national unemployment rate.²¹ However, state unemployment rates, and the one year change in those rates, also significantly relate to differences in retrospective economic evaluations. In the second column, we replace the national unemployment measures with year fixed effects. The results in this column are qualitatively similar, but with smaller standard errors.

²¹This replicates the findings of Clarke and Stewart (1994) and Haller and Norpoth (1994, 1997), among others, who show that *national* retrospective economic evaluations are strongly correlated with *national* economic conditions across time.

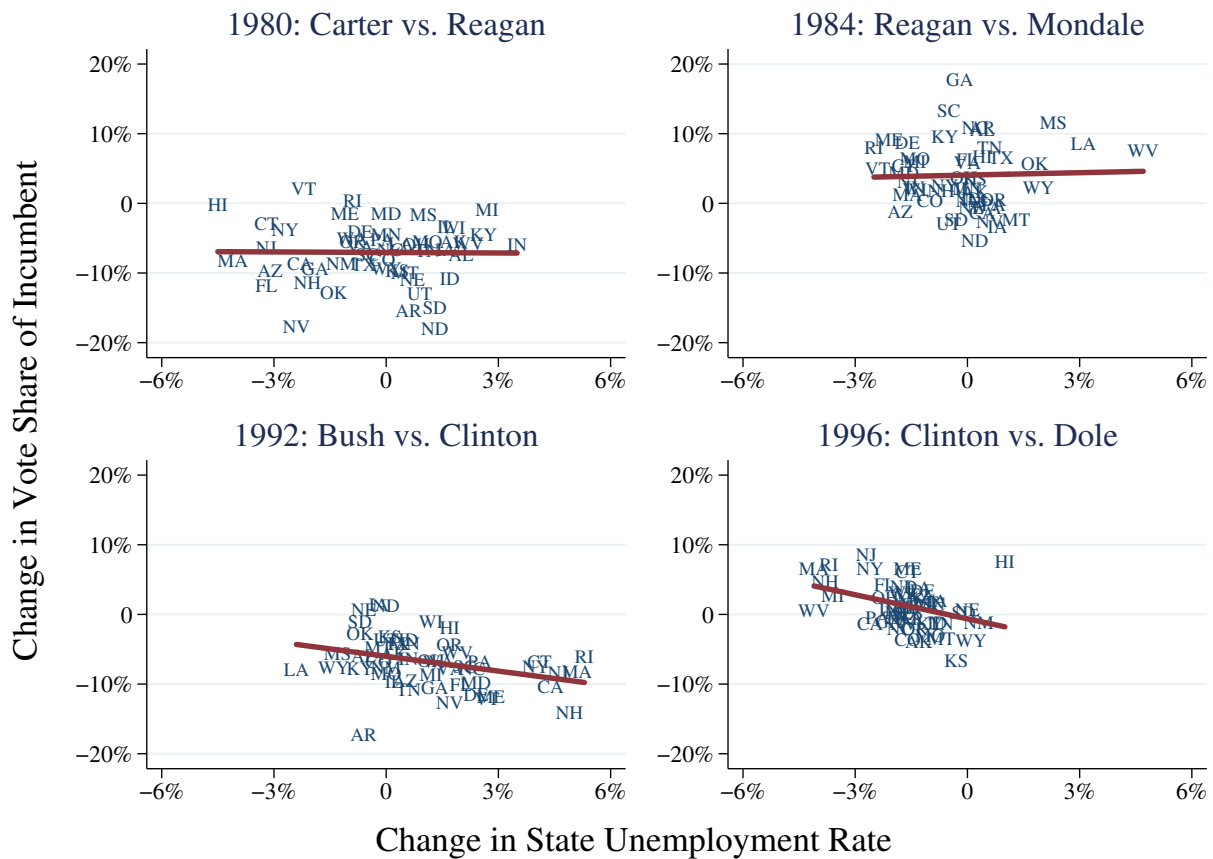
A concern with the results in columns 1 and 2, as well as those in the previous section, is that some states may have chronically higher unemployment, and respondents in that state may generally be pessimistic about the economy for idiosyncratic reasons. To address this concern, we exploit the panel structure of our data and include state fixed effects in column three. Once again, both the level and change in the state unemployment rate are significantly correlated with national retrospective economic evaluations. The coefficients imply that independent variation in state unemployment rates has about 25% of the effect of similar variations in the national unemployment rate.

A contention of our theory is that people seek out information about macro-economic conditions because it helps them learn about their personal unemployment rate. Thus, for it to be in an individual's interest to seek out information about the state economy, it must be the case that state-level conditions help inform him or her about their own economic situation. To test whether this is the case, we repeat the specifications in columns 1 through 3 for respondents' personal retrospective economic evaluations. These columns show that state-level conditions do seem to inform respondents' assessments of their personal economic condition. Moreover, state level conditions are a relatively more important determinant of personal evaluations than national evaluations.

Having documented an independent effect of *state* economic conditions on *national* economic evaluations across time, we next examine the extent to which state unemployment affects political support. As discussed in Section 1.1, previous work focused on single elections finds inconsistent results about the effect of state-level economic conditions on state-level presidential vote shares. This is shown in Figure 2, which explores the relationship between the change in state unemployment and the change in the incumbent's vote share in four presidential elections. While there is no relationship between these changes in 1980 and 1984, there is a strong negative relationship in 1992 and 1996.²² This variability demonstrates that focusing on a single cross-section with only 50 observations reduces statistical power,

²²There was also no relationship in 2004. We omit this graph due to space constraints.

Figure 2: There is an inconsistent relationship between changes state unemployment and changes in incumbent vote share, election-by-election.



and may lead to results driven by other, uncontrolled, factors.

We build on this literature by relating state unemployment rates to presidential approval from 1981–2008. To do so, we code every Gallup poll on the Roper Center web site that identifies the state of the respondent and asks about presidential approval. These polls, 745 in all, allow us to construct a monthly panel of presidential approval in each state. This gives us substantially greater statistical power to detect the effect of state employment conditions on presidential approval.

Table 6 shows that both national and state unemployment significantly affect presidential approval. The results in column 1 imply that a one percentage point increase in the national

Table 6: State unemployment rates are correlated with presidential support.

Dependent Variable: Presidential Approval (Gallup) (100 = 100% approval, -100 = 100% disapproval)				
National Unemployment Rate	-6.44***			
	(1.27)			
Δ National Unemployment Rate		0.79		
		(1.71)		
State Unemployment Rate	-1.22		-1.16***	
	(1.20)		(0.41)	
Δ State Unemployment Rate		0.08		
		(1.81)		
State Unemployment:				
Under Reagan				-1.03
				(0.75)
Under Bush (I)				-1.50***
				(0.39)
Under Clinton				-0.97
				(0.65)
Under Bush (II)				-1.36**
				(0.65)
Month X Year Fixed Effects	No	No	Yes	Yes
State X President Fixed Effects	Yes	Yes	Yes	Yes
State X Month Observations	15,304	15,304	15,304	Varies

Notes: ***, **, * denote statistical significance at the 1%, 5% and 10% level with robust standard errors clustered at the state level (51 clusters). All specifications are implemented via OLS regressions. Column 4 contains the results of 4 separate regressions, one for each Presidency.

unemployment rate is associated with a roughly three percentage point decrease in presidential approval.²³ In comparison, the coefficient on the state unemployment rate implies that a one percentage point increase in the state unemployment rate reduces presidential approval by about 0.6 percentage points, although this coefficient is not statistically signif-

²³The dependent variable in this analysis is the average approval in state where approving equals 100, disapproving equals -100, and neither approving or disapproving equals zero. Under this coding scheme, a coefficient of six corresponds to a three percentage point change in approval. This point estimate here is quite similar to that in Mueller's (1970) seminal study of the effect of national unemployment on presidential approval from 1945 to 1968.

icant at conventional levels. However, once we control for national trends using monthly fixed effects, in column 3, the standard error drops substantially so that effect of state unemployment is significant at the $p < 0.01$ level. The coefficient on state unemployment is roughly about 20% of the magnitude of the coefficient on the national unemployment rate, which is quite similar to the ratio of the estimated coefficients for state unemployment and national unemployment on aggregate economic evaluations in Table 5.

Column 4 of Table 6 shows that the relationship between state unemployment and presidential approval is fairly stable across different presidencies. The implied effect of a one percentage point increase in state unemployment on presidential approval ranges from about 0.5 during the Clinton presidency to 0.75 percentage points for the Bush (I) presidency, although this effect is only statistically different from zero for the Bush (I) and Bush (II) presidencies. The consistency of these results across time, unlike the results in Figure 2, and previous cross-sectional analyses, suggests the effect of state unemployment on presidential approval is relatively stable across time.

We believe that we are the first to document the independent effect of state unemployment across time on presidential approval. This contrasts with Strumpf and Phillippe (1999) and Eisenberg and Ketcham (2004), which find that state unemployment does not affect presidential vote share.

6 Discussion: The Shifting Nature of Economic Voting

Consistent with our theory, we have shown that perceptions of macro-economic conditions associate with macro-economic conditions. Specifically, data from the CCES shows that individuals who are members of groups that are more likely to be unemployed report higher national unemployment rates. Likewise, both aggregate and personal retrospective economic evaluations on the ANES are worse in states with higher unemployment. These differences in perceptions are politically important: vote choice significantly associates with reported

unemployment, and presidential approval significantly associates with state unemployment.

These empirical findings suggest that theories of economic voting that do not explicitly account for the process by which voters acquire information about the aggregate economy are necessarily incomplete. They also highlight an opportunity for researcher about the micro foundations of economic voting. As voters are imperfectly informed about the aggregate economy, and political preferences depend on this information, voters' preferences may change as they become informed about the state of aggregate economic conditions. Thus, experiments that randomly provide voters with information about different aspects of the aggregate economy may provide tremendous insight into the types of information that affect voter behavior. This may, in-turn, help us better understand the micro foundations underlying the robust positive correlation between economic and incumbent performance.

We believe these results also have implications for election forecasting. As voters are influenced by their mecro-economies, vote patterns are affected by the structure of the economy. The U.S. economy has changed in many ways since the inaugural studies of economic voting in the early 1970s. In particular, industries such as steel and auto manufacturing have shrunk in both relative and absolute size, and services have become a much larger part of the economy. Thus, an election forecasting model based on the pattern of economic voting in the 1970s might be out of date by the mid-2000s. In general, forecasting models may incorrectly predict support for the incumbent party, and the size of the error will depend on both the size of the relative groups, which may shift across time, and the unemployment rate of those groups. This is consistent with the fact that vote share is sometimes several standard deviations away from the predictions of economic voting models. For example, the original Fair (1978) economic voting model, which is based on macro-economic variables, was updated many times in order to produce more accurate estimates. Even so, in 2004, this model produced results that were off by as much as four standard deviations (Fair, 2006).²⁴

This brings us back to the Kramer (1983) critique of using individual level data to un-

²⁴Note that at least one standard deviation may be due to the Iraq War, see Karol and Miguel (2008).

derstand economic voting. Kramer maintained that variation in individual level responses to survey questions were largely noise, and thus, were either uninformative about, or produced biased understandings of, the mechanisms underlying economic voting. Our findings challenge this critique in two ways. First, we have shown that individuals' reports of economic perceptions seem to incorporate real information about their economic conditions. Second, economic perceptions are associated with differences in political support in both individual and aggregate data. This turns the Kramer critique on its head: ignoring individuals' economic perceptions and, instead, using only macro-economic data, runs the risk of creating a biased understanding of economic voting.

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Appendix: Not Intended for Publication

In order to make the logic in Sections 2 and 3 more precise, this section formalizes them. As the main result, that more accurate signals are more valuable, follows directly from Persico (2000), it is possible to state much of the theory in far greater generality. For example, the theory with continuous signals of economic outcomes, such as income growth would look much the same. However, as the goal here is to present the logic, straightforward way, we have made every effort to keep the formalization here as simple as possible.

A.1 Formalization

Here we consider a two period model where a continuum of individuals seek information in order to make optimal savings decisions. Each individual uses information revealed in this process about the effects of an incumbent politician's economic policies to inform his sincere vote. In the second period, each individual consumes his wages and savings: no choices are made. The fact that there is a continuum of individuals, and employment and unemployment are determined only by the policies of the incumbent politician in each period, means that we can focus on the decision problems of a single individual, taking the decision of all other individuals as given.

Consider an individual with a per period utility of consumption given by $u(\cdot)$, which is continuous, strictly increasing, and strictly concave. At the beginning of the first period the individual may be employed at a wage w , and is endowed with some amount $\varepsilon \geq w$, and. The individual saves an amount s from the first to the second period. His total expected utility if he is employed in the first period, as a function of the unemployment rate in the second period $R \in (0, 1)$ is given by

$$U(s|R) = u(\varepsilon + w - s) + Ru(s) + (1 - R)u(w + s)$$

Fact 1 *The optimal savings rate s^* is in the interval $(0, \frac{\varepsilon+w}{2})$ if the individual is employed in the first period, and $(0, \frac{\varepsilon}{2})$ if unemployed. s^* is increasing in R .*

We follow the citizen-candidate tradition in assuming that each politician's policies are known and fixed. However, we add a slight twist in that the effects of these policies on each individual's macro-economy is unknown. Specifically, the individual's personal unemployment rate $R \in \{L, H\}$ is either low L , or high, H , with $L < H$ and $L + H < 1$. Although the individual votes sincerely in the election, he knows he is not pivotal, and takes the probability that the incumbent will be reelected as some exogenous probability ξ .

The individual believes each politician's economic policies have a prior probability π of generating a high unemployment rate for him. He also witnesses two imperfect signals of his personal unemployment rate under the incumbent politician, his personal employment situation, $\sigma_E \in \{0, 1\}$ —equal to zero if he is unemployed, and one if employed—and the aggregate unemployment rate $\sigma_{R^a} \in \{0, 1\}$, where one indicates a high unemployment rate, and zero a low unemployment rate. Signals are correlated with personal unemployment rates in the following way: $P(\sigma_{R^a} = 0 | R = L) = \gamma = P(\sigma_{R^a} = 1 | R = H)$, where $\gamma > \frac{1}{2}$.²⁵ The probability an individual is employed if his personal unemployment rate is high, $P(\sigma_E = 1 | R = H)$, is $1 - H$, and so on.

Defining $\pi(\sigma)$ as the posterior probability the individual's personal unemployment rate is high given signal σ , and redefining signal realizations so H is the realization that results in a higher posterior probability and L is the one resulting in a lower posterior, we have:

Definition 1 *We say signal j is more **accurate** than signal k if:*

$$\pi(\sigma_j = H) \geq \pi(\sigma_k = H) \geq \pi(\sigma_k = L) \geq \pi(\sigma_j = L)$$

²⁵This implies

$$\text{Corr}(R, \sigma_{R^a}) = (2\gamma - 1) \sqrt{\frac{\pi(1 - \pi)}{\pi^i(1 - \pi^i)}}$$

where $\pi^i = P(\sigma_{R^a} = 0) = \pi\gamma + (1 - \pi)(1 - \gamma)$.

Thus, a binary signal is more accurate than another if either realization of the signal results in greater certainty of the underlying state. Note that this is not a strict ordering, as some signals may produce more certainty than another with a high realization, but less certainty with a low realization.

Proposition 1 *More accurate signals are more valuable.*

Returning to the particulars of our model, we make a simple assumption on the parameters of the signaling structure:

Assumption 1 *We assume that*

$$\gamma > \frac{H}{L + H}. \tag{1}$$

Using personal unemployment rates of $H = 10\%$ and $L = 5\%$, this means that (1) holds when $\gamma > \frac{2}{3}$. That is to say, employment status is a less accurate signal than knowing 10% of the county is unemployed if, when 10% of the county is unemployed, there is greater than a two-thirds chance that you will also become unemployed with 10% probability. We believe this is reasonable and assume it throughout.

Fact 2 *When (1) holds, then σ_{R^a} is more accurate than σ_E .*

While the individual will observe σ_E , they will likely have to seek out σ_{R^a} . This last fact tells us that as long as the cost of seeking out σ_{R^a} is sufficiently low, the individual will do so.

The individual can thus use both his personal employment status σ_E and the aggregate unemployment rate σ_{R^a} to inform his (sincere) vote. If both the aggregate unemployment rate is low and the individual is employed, it is straightforward to show he will vote for the incumbent. This occurs because the individual's posterior belief that the incumbent's policies are good for him will be greater than π , the probability that a challenger's economic

policies are good for him. Likewise, if the individual is both unemployed and aggregate unemployment rate is high, then the individual will vote for the challenger.

To determine how the individual will vote when they are employed, but the aggregate unemployment rate is high is more subtle. Specifically, it requires knowledge of the probability that both signals have a given realization when the incumbent's policies are either good or bad. While there are a variety of ways to structure these probabilities, we assume that the signals are conditionally independent, which can hold if the individual is a very small part of the aggregate economy. That is, $P(\sigma_E = e \cap \sigma_{R^a} = r | R) = P(\sigma_E = e | R) * P(\sigma_{R^a} = r | R)$.

Proposition 2 *If $\gamma > \frac{1-L}{2-L-H}$, then an individual's vote choice will be determined by the aggregate unemployment rate when he is employed, but his employment status when he is unemployed. If $\gamma > \frac{H}{L+H}$, as in (1), then an individual's vote choice will always be determined by the aggregate unemployment rate.*

The proposition holds because being employed is an extremely weak signal that the incumbent's economic policies are good for the individual, and so it is easily outweighed by the better signal of the aggregate unemployment rate.

A.2 Proofs

Proof of Fact 1: Note that:

$$\frac{dU(s|R)}{ds} = -u'(\varepsilon + \mathbb{I}_E w - s) + Ru'(s) + (1 - R)u'(w + s) \quad (2)$$

$$\frac{d^2U(s|R)}{ds^2} = u''(\varepsilon + \mathbb{I}_E w - s) + Ru''(s) + (1 - R)u''(w + s) < 0 \quad (3)$$

where \mathbb{I}_E is an indicator equal to one if the individual is employed in the first period. As (3) indicates that $U(s|R)$ is strictly concave, (2) will imply a unique equilibrium level of savings,

s^* . Setting $s = 0$ and $s = \varepsilon + \mathbb{I}_E w$, respectively gives

$$\begin{aligned}
\left. \frac{dU(s|R)}{ds} \right|_{s=0} &= -u'(\varepsilon + \mathbb{I}_E w) + Ru'(0) + (1 - R)u'(w) \\
&\geq -u'(w) + Ru'(0) + (1 - R)u'(w) \\
&= -R(u'(w) - u'(0)) = -R \int_0^w u''(x)dx > 0 \\
\left. \frac{dU(s|R)}{ds} \right|_{s=\varepsilon+\mathbb{I}_E w} &= -u'(0) + Ru'(\varepsilon + \mathbb{I}_E w) + (1 - R)u'(\varepsilon + \mathbb{I}_E w + w) \\
&< -u'(0) + u'(\varepsilon + \mathbb{I}_E w) = \int_0^{\varepsilon+\mathbb{I}_E w} u''(x)dx < 0
\end{aligned}$$

so s^* will be in the interior of $(0, w)$. The integral representation follows from the fundamental theorem of calculus. As (2) defines s^* , we can use implicit function theorem to (via implicit differentiation) to determine

$$\frac{ds^*}{dR} = - \frac{\frac{\partial}{\partial R} \left(\frac{dU(s|R)}{ds} \right)}{\frac{\partial}{\partial s^*} \left(\frac{dU(s|R)}{ds} \right)} = \frac{\int_s^{w+s} u''(x)dx}{u''(\varepsilon + \mathbb{I}_E w - s) + Ru''(s) + (1 - R)u''(w + s)} > 0 \quad (4)$$

Thus, s^* is increasing in R , it is maximized when $R = 1$. When $R = 1$, s^* solves $u'(\varepsilon + \mathbb{I}_E w - s) = u'(s)$, that is, $s^* = \frac{\varepsilon + \mathbb{I}_E w}{2}$. Thus, $s^* \in (0, \frac{\varepsilon + \mathbb{I}_E w}{2})$. ■

Proof of Proposition 1: Because of the independence property of preferences underlying the utility representation, we can ignore the exogenous probability $1 - \xi$ that the incumbent will not be re-elected, as this will proportionally lower the value of all signals. Moreover, without loss of generality, we can consider the case where $\varepsilon = 0$, and the individual is employed in the first period (or $\varepsilon = w$, and the agent is unemployed). Noting that u is concave and thus satisfies single-crossing, the result follows immediately from Theorem 1 of Persico (2000) or Lehmann (1988).²⁶ ■

²⁶A brute-force proof is available from the authors upon request.

Proof of Fact 2: Start by re-writing (1) as the first inequality below:

$$\frac{\gamma}{1-\gamma} > \frac{H}{L} > \frac{1-L}{1-H}. \quad (5)$$

The second inequality follows from the fact that $H > L$ and $L + H < 1$. We have that

$$\begin{aligned} \gamma(1-\pi)L &> H(1-\pi)(1-\gamma) \\ \pi\gamma(\pi H + (1-\pi)L) &> \pi H(\pi\gamma + (1-\pi)(1-\gamma)) \\ \pi(\sigma_{R^a}=1) = \frac{\pi\gamma}{\pi\gamma + (1-\pi)(1-\gamma)} &> \frac{\pi H}{\pi H + (1-\pi)L} = \pi(\sigma_E=1). \end{aligned}$$

Using the second inequality in (5) we have

$$\begin{aligned} \gamma(1-\pi)(1-H) &> (1-\gamma)(1-\pi)(1-L) \\ \pi(1-H)(\pi(1-\gamma) + (1-\pi)\gamma) &> \pi(1-\gamma)(\pi(1-H) + (1-\pi)(1-L)) \\ \pi(\sigma_E=0) = \frac{\pi(1-H)}{\pi(1-H) + (1-\pi)(1-L)} &> \frac{\pi(1-\gamma)}{\pi(1-\gamma) + (1-\pi)\gamma} = \pi(\sigma_{R^a}=0). \end{aligned}$$

Thus, $\pi(\sigma_{R^a}=1) > \pi(\sigma_E=1) > \pi(\sigma_E=0) > \pi(\sigma_{R^a}=0)$, so σ_{R^a} is more accurate than σ_E . ■

Proof of Proposition 2: If the individual is employed, but the unemployment rate is high in the individual's macro-economy, then he will vote for the challenger when

$$\frac{\pi(1-\gamma)(1-L)}{(1-\pi)\gamma(1-H) + \pi(1-\gamma)(1-L)} < \pi \iff \gamma > \frac{1-L}{2-L-H}.$$

which is assumed to be true as in (5). If, instead, the individual is unemployed, but the unemployment rate is low, then the individual will vote for the incumbent when

$$\frac{\pi\gamma L}{\pi\gamma L + (1-\pi)(1-\gamma)H} > \pi \iff \gamma > \frac{H}{L+H},$$

which is satisfied whenever (1) is true.

The statement of the proposition holds when

$$\frac{H}{L+H} > \frac{1-L}{2-L-H}.$$

This is true as long as

$$\frac{H}{L} > \frac{1-L}{1-H},$$

which is shown to hold in (5).

■