Mecro-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' perceptions of macro-economic performance are affected by economic conditions of people similar to themselves. Our theory alleviates two persistent issues in the literature: it shows how egotropic motivations can lead to behavior that appears sociotropic, and why relying exclusively on aggregate data may underestimate the amount of economic voting. We test our theory using both cross-sectional and time series data. We document new stylized facts in aggregate data: state-unemployment is robustly correlated with national economic evaluations and presidential support. A novel survey instrument that asks respondents their numerical assessment of the unemployment rate confirms that individuals' economic perceptions respond to the economic conditions of people similar to themselves. Further, these perceptions associate with individuals' vote choices.

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1 Introduction

One of the most robust relationships in political science is economic voting: the positive correlation in aggregate, time-series, data between an area's economic performance and the political performance of incumbent politicians and parties. Many theories have been proposed to explain this phenomena.[1] For example, egotropic, or pocketbook, theories posit that individuals vote based on evaluations of their own economic circumstances, while sociotropic theories posit that individuals vote based on their evaluations of national economic conditions (Kinder and Kiewiet, 1979; Kiewiet, 1983). However, as aggregate economic conditions are just the average of individual economic circumstances, these two theories, like most theories of economic voting, produce the same prediction in aggregate data.

We construct an incomplete-information theory of economic voting that produces a more nuanced prediction in aggregate data: namely local economic conditions affect the economic vote for national office. Voters have little incentive to expend costly effort gathering economic information to make political decisions (Downs, 1957; Popkin, 1991). Rather, individuals gather economic information to inform personal economic choices, and use the same information to inform their political choices. The economic information that individuals find both the most useful for consumption smoothing and easiest to obtain is information about people similar to them in terms of profession, age, education level, race, location of residence and so on. Following some economists, we refer to these groups as individuals' *mecro*-economies (so called because they are somewhere between *macro*- and *micro*-economy). Thus, mecro-economic voting predicts that that voters' perceptions of the aggregate economy, and therefore political support, will correlate with conditions in their mecro-economies. An implication is that evaluations of *national* economic conditions and presidential approval will be worse in geographic areas with higher unemployment.

This more nuanced prediction seems to immediately falsify our theory, as it contrasts with

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

previous studies that have found no effect of state unemployment on presidential vote share across time (Strumpf and Phillippe, 1999; Eisenberg and Ketcham, 2004).[2] However, this lack of findings likely stems from two data issues. First, state and national unemployment are highly correlated, and second, there have been relatively few presidential elections since the collection of disaggregated economic data began. This suggests that the absence of evidence about the importance of local conditions reflects a lack of statistical power, rather than an absence of local effects.

Indeed, when we construct a time-series of state-level presidential approval from Gallup, by month, from 1981 to 2008, we find that state unemployment is robustly related to support for the incumbent. Moreover, using data from the American National Election Study (ANES) over the same time period, we find that respondents from states with higher rates of unemployment report more negative retrospective economic evaluations, after controlling for national trends. These new empirical findings suggests that theories of economic voting that do not explicitly account for the effects of local conditions are necessarily incomplete.[3]

Our theory separates the steps involved in forming economic evaluations, and focuses on economic perceptions. All theories of economic voting require that individuals form *perceptions* of the economy, and then *judge* whether the economy is performing well or poorly based on those perceptions, in order to form an economic *evaluation*. We predict that perceptions of aggregate economic performance will reflect mecro-economic conditions, especially when information about aggregate economic conditions is not easily observable. Testing this prediction is difficult as most economic survey questions, like the ANES retrospective economic evaluation, confound individuals' perceptions and judgments of economic performance.

[2]Studies focusing on specific elections find mixed evidence about the relationship between state economic conditions and presidential candidates vote shares. This mixed evidence reflects, in part, the difficulty of fully controlling for variables that jointly affect local economic conditions and presidential vote shares in cross-sectional data, and points to the importance of controlling for state level fixed effects across time, as we do in our analysis.

[3]While there are several studies that find retrospective economic evaluations are correlated with national economic conditions (for example: Clarke and Stewart, 1994; Haller and Norpoth, 1994, 1997) and that gubernatorial popularity and votes are correlated with state economic conditions (for example: Hansen, 1999; Wolfers, 2002; Cohen and King, 2004), we believe we are the first to document an independent effect of *state* economic conditions on *national* economic evaluations and political support across time.

In order to examine how mecro-economic conditions affect perceptions of the aggregate economy, we use a novel survey instrument from the 2008 Cooperative Congressional Election Survey (CCES) that asks respondents to report their perception of the national unemployment rate. This instrument allows us to directly compare real world rates of unemployment with respondents' perceptions.[4] 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 all report higher rates of *national* unemployment. Consistent with aggregate patterns, individuals from states with higher unemployment rates also report higher unemployment. Moreover, reported unemployment rates associate with vote choice, even when controlling for numerous other factors.

Additionally, our theory predicts that perceptions of aggregate economic conditions will be more homogeneous among individuals that actually observe 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 perceptions of aggregate economic conditions than those who do not. In contrast, as gas prices are rarely reported in national news, 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 theory tempers two persistent conflicts in the economic voting literature. First, it shows how egotropic motivations can lead to behavior that appears sociotropic. In particular, we formalize a model that shows when voters' own economic circumstances diverge from their signal of aggregate economic performance, they will vote on the basis of aggregate economic perceptions. This is not because individuals have sociotropic motivations. Rather, an individual's own economic circumstance is a very noisy signal of the performance of their mecro-economy. This connection is useful as it contributes to resolving a significant conflict in the literature: egotropic voting is cognately simpler and more consistent with rational

[4]This 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 perceptions (Ansolabehere, Meredith and Snowberg, 2011).

voting (Fiorina, 1981; Kinder and Kiewiet, 1981; Gomez and Wilson, 2001), yet evidence overwhelmingly points to sociotropic behavior by voters.

Second, our theory challenges Kramer's (1983) injunction against using individual level data to study economic voting due to concerns about the sources of heterogeneity in such data. We show that a substantial portion of the cross-sectional variation in economic perceptions is driven by real differences in perceptions of aggregate conditions.

1.1 Relation to the Literature

This paper contributes to the general literature on economic voting by providing a theory with testable implications in both aggregate and cross-sectional data, and documenting new empirical facts in aggregate, time-series, data. We contribute to the literature on heterogeneity in economic evaluations by drawing attention to the distinction between economic perceptions and the judgment of those perceptions in forming economic evaluations, and documenting new empirical facts about economic perceptions. 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.

Economic Voting. This manuscript is unique as it uses both aggregate and individual data to test a novel theory; this difference is facilitated by the fact that our theory makes predictions in aggregate data that go beyond the standard prediction that better aggregate economic performance leads to better incumbent performance.[5] Moreover, we are the first to demonstrate that heterogeneity in aggregate economic perceptions has consequences for political support, using the sort of aggregate, time-series data endorsed by Kramer (1983).

[5]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 perceptions is driven by extraneous factors.[6] However, our theory suggests, and our results show, that as cross-sectional variation in economic evaluations is driven by actual differences in economic perceptions, 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.[7] Both votes are identified as economically based in cross-sectional data, but cancel each other out in aggregate data.[8]

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*. However, variants of the retrospective economic evaluation, the modal source of cross-sectional data, elicits respondents' evaluations, which confound 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.

Mecro-economic voting theory predicts that differences in what economic information is relevant and available to individuals will lead to heterogeneity in perceptions of the aggregate economy. Specifically, those with greater risks of unemployment should perceive higher levels of unemployment. Therefore, we directly elicit unemployment perceptions by asking respondents what the national unemployment rate is.[9] This is related to the substantial literature examining heterogeneity in economic evaluations, although we focus on perceptions.[10]

[6] Van 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."

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

[8] As a result, it is not surprising that the associations between economic conditions and vote choice identified using aggregate, time-series, data tend to be smaller than those identified using cross-sectional data (Duch and Armstrong, 2010).

[9] Ansolabehere, 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.

[10] See Kiewiet (1983); Weatherford (1983*a*,*b*); Conover, Feldman and Knight (1986); Kinder, Adams and

Our work is thus most closely related to a small literature that examines how different groups respond to economic information across time. Hopkins (2011) shows that stock-market returns 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. However, 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 that notes the asymmetric impacts of good versus bad economic news, focus on heterogeneity in voters' judgments of economic conditions, rather than differences in perceptions (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. Indeed, the authors state, "Were [differences in information] the only relevant cognitive factor, one would certainly expect less sophisticated people to be more likely to engage in pocketbook voting." (Gomez and Wilson, 2001, p. 901). 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.

Gronke (1989); Mutz (1992*b*, 1993, 1994); Hetherington (1996); Holbrook and Garand (1996); Anderson, Duch and Palmer (2000); Palmer and Duch (2001); Duch and Palmer (2002); Anderson, Mendes and Tverdova (2004); Duch and Stevenson (2008); Reeves and Gimpel (2011) for some notable examples. Much of the recent work on this topic focuses on the relationship between partisanship and economic evaulations (Wlezien, Franklin and Twiggs, 1997; Anderson, Mendes and Tverdova, 2004; Evans and Andersen, 2006; Evans and Pickup, 2010). Previous studies have found observables such as gender, race, and education often have significant associations with cross-sectional variation in economic evaluations.

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, forthcoming, for recent examples).

The next two sections develop the theory of mecro-economic voting. The fourth section considers aggregate data. The fifth section shows variations in individual perceptions of unemployment are consistent with our theory, and the sixth, that reported vote choices are also consistent. The seventh concludes.

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 the macro-economy, a space economists sometimes refer to as the mecro-economy.

We also assume that voters are egotropic: they vote based on their own economic circumstances. While there are many mechanisms that might lead to similar patterns of political support, we adopt a particularly simple formulation. 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. Each individual compares his or her ex-post belief to a common baseline, and votes for the incumbent if his or her ex-post belief is greater than the baseline, and otherwise he or she votes 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.[11] As shown formally in the appendix,

[11]We focus throughout on unemployment because it is important for economic voting, is directly experienced by individuals, and varies markedly, and measurably, between groups. when using higher quality

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 error. At the other extreme is the national unemployment rate, which is drawn from a large enough sample to essentially eliminate sampling error, but pools an individual's personal unemployment rate of interest with the rates of everyone else.

An individual prefers information that is somewhere between the national and the personal level. This information has lower 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 were sociotropic: that is, if they

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.

wanted to vote for the candidate that is best for the aggregate economy. Unless sociotropic voters expend costly effort to become fully informed about the state of the aggregate economy, there will still be heterogeneity in these perceptions. Moreover, this heterogeneity will relate to individual's own economic circumstances. Thus, observing that individuals' own economic circumstances relate to voting behavior is not necessarily evidence of egotropic voting. However, we maintain the assumption of egotropic motivations as previous scholars find it preferable due to its simplicity, and to show, in the next section, that it produces patterns similar to sociotropic motivations.[12]

3 A Prediction: Sociotropic Voting

Here we show that the theory above 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 mecro-economic voting centers on the individual's attempt to understand his or her personal economic circumstances. However, it follows from the fact that general trends provide more information about an individual's personal unemployment rate than does the single observation of an individual's current employment status. This section sketches an argument made formally 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

[12]Additionally, our empirical results could also be rationalized by voters who are concerned with the well being of others in their mecro-economy. However, two findings cast doubt on this interpretation. First, our study finds differences in perceptions that are correlated with groups such as age and state which are not generally thought to be the basis of group-based preferences. Secondly, previous research finds that voters do not vote on group-based perceptions (Kinder, Adams and Gronke, 1989; Mutz and Mondak, 1997).

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). Suppose further that before a politician is elected, there is a 50% chance that her economic policies will cause the individual to have a high 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 unemployment rate of people who are similar to him. However, personal unemployment status is much less informative than the unemployment rate of people who are similar to him. If an individual is unemployed, then he will believe there is a 67% chance that the incumbent's economic policies have resulted in a high unemployment rate for him. But, if 5% of people that are similar to him are unemployed, he will be nearly certain that the incumbent's policies have induced a low personal unemployment rate. Moreover, note that if the individual is employed, there is only a 51% chance that the incumbent's economic policies have resulted in a low unemployment rate. Thus, when an individual is employed, the unemployment rate of people similar to him will be even more valuable.

Obviously, if an individual could observe a large number of people who were exactly like him, he would have a perfect signal of his personal unemployment rate. However, generally one can only observe a limited number of individuals, who are not exactly the same. That is, he can observe the unemployment rate in his mecro-economy.

How highly correlated must an individual's mecro-economic and personal unemployment rate be for the individual to ignore his personal employment status? As shown in the

appendix, these rates must have a correlation greater than $\frac{1}{3}$.

Is it reasonable that the correlation between the individual's mecro-economic and personal unemployment rates have a correlation greater than $\frac{1}{3}$? As a proxy, the correlation in annual unemployment rates between the U.S. average and any state, over the period from 1976 to 2008, is greater than $\frac{2}{3}$ for all states but Wyoming, where the correlation is 0.44. Therefore, it is likely that any relevant unemployment rate has a sufficiently high correlation to warrant individuals ignoring their personal employment status.[13]

The implication of this simple example is quite similar to sociotropic voting—individuals' evaluations of general economic trends are more predictive of vote choice than reports of personal economic circumstances. This does not occur because of altruism, but because group level information is a powerful signal of whether or not the incumbent's economic policies are good for the individual.

4 Evidence from Time-Series Data

The theory of mecro-economic voting predicts that economic perceptions, evaluations, and political behavior should vary with local economic conditions. Yet, this is counter to many previous studies of aggregate time-series data which find no relationship between local conditions and evaluations or vote choice (Strumpf and Phillippe, 1999; Eisenberg and Ketcham, 2004). However, the absence of evidence here is not evidence of absence: local conditions are highly correlated with national conditions, implying that statistical power will be an issue with the small datasets used. By constructing longer time series, we are able to identify independent effects of local conditions on economic evaluations and political support.

Moreover, studies focusing on specific elections have found mixed evidence about the relationship between state economic conditions and presidential candidates' vote shares.

[13] An individual's employment status may still be useful information. When a individual cannot directly observe unemployment rates, being unemployed is a signal that the individual's personal unemployment rate is high. As shown in the next section, unemployed individuals do indeed perceive the unemployment rate is higher.

Abrams and Butkiewicz (1995) finds that changes in state-level unemployment and income growth are correlated with Bush's vote share in 1992. Abrams (1980) finds similar patterns in 1956, but only limited evidence that local economic conditions relate to Nixon's vote share in 1972. Lacombe and Shaughnessy (2007) finds Bush's vote share was higher in counties with lower unemployment rates in 2004. In contrast, Brunk and Gough (1983) finds that Carter's vote share was significantly better in states with high unemployment in 1980. These mixed findings are consistent with more Republican areas having lower unemployment, and point to the importance of controlling for state level effects across time, as we do in our analysis.

In particular, we analyze how state unemployment rates correlate with retrospective economic evaluations and presidential approval within a state, after controlling for national trends. 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 mecro-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, namely, state unemployment is less correlated with a voter's personal unemployment rate than local information.[14] To the extent that this is true, this will create noise, making it more difficult for us to find an effect of state unemployment on economic evaluations and presidential support.

We first examine the standard national retrospective economic evaluation from the American National Election Survey (ANES), which asks:[15]

> 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?

[14] Reeves and Gimpel (2011) find more disaggregated measures of regional unemployment exhibit a stronger correlation with economic evaluations than the state unemployment rate in 2008.

[15] In order to maintain consistency with Section 5 we would prefer to also be able to examine unemployment perceptions across time. However, data on unemployment perceptions is extremely limited.

This question was asked from 1980 to 2008, with the exception of 2006.[16]

Mecro-economic voting theory predicts that respondents in states with higher unemployment rates, or states where unemployment increased dramatically in the past 12 months, will report relatively worse national retrospective evaluations than respondents in states with low levels of unemployment. Table 1 shows this is the case. The first column shows 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. However, state unemployment rates, and the one year change in those rates, are also related 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.

A concern with the specifications in columns 1 and 2 is that some states may have chronically higher unemployment, and respondents in that state may generally be pessimistic about the economy for non-economic reasons. Such concerns also plague previous works that finds association between local economic conditions and national economic assessments in a specific cross-section (Weatherford, 1983*b*; Books and Prysby, 1999; Lewis-Beck, 2006; Reeves and Gimpel, 2011). 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 final concern is that state-level conditions are a poor proxy for the mecro-economies that individuals pay attention to. To address this concern, we repeat the specifications in columns 1 through 3 for respondents' personal retrospective economic evaluations. The patterns are much the same as national economic evaluations, suggesting that it is reasonable to focus on state-level conditions.

[16]The 2006 ANES used a 3 point scale, rather than a 5 point scale, and hence, is not directly comparable.

Table 1: State unemployment is correlated with national retrospective economic evaluations, even when controlling for national trends.

Dependent Variable:	National Retrospective Economic Evaluation in State (ANES) (1 = Much Worse, 5 = Much Better)			Personal Retrospective Economic Evaluation in State (ANES)		
State Unemployment Rate	-0.020***	-0.015**	-0.034***	-0.033**	-0.036***	-0.068***
	(0.006)	(0.006)	(0.012)	(0.013)	(0.011)	(0.018)
Δ State Unemployment Rate	-0.033	-0.059***	-0.050***	-0.057**	-0.042*	-0.026
	(0.022)	(0.008)	(0.010)	(0.020)	(0.021)	(0.023)
National Unemployment Rate	-0.046			-0.012		
	(0.087)			(0.033)		
Δ National Unemployment Rate	-0.27***			-0.11*		
	(0.060)			(0.052)		
Constant	2.96***	1.99***	2.17***	-2.56***	-2.86***	-2.52***
	(0.63)	(0.05)	(0.08)	(0.25)	(0.092)	(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.

We believe we are the first to document an independent effect of *state* economic conditions on *national* economic evaluations across time. Previous studies find *national* retrospective economic evaluations are correlated with *national* economic conditions across time (for example: Clarke and Stewart, 1994; Haller and Norpoth, 1994, 1997), a finding we replicate, and substantively add to.

Next, we examine the extent to which state unemployment affects political support. Specifically, we relate levels of, and one-year changes in, state unemployment rates to presidential approval. To do so, we capture every Gallup poll on the Roper Center Web site between 1980–2008 that reported presidential approval and the state of residence for each respondent. We use these polls, 745 in all, to construct monthly presidential approval rates

for each state. These approval rates are regressed on unemployment rates in Table 2.[17]

Table 2: 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.

Table 2 shows that a one percent increase in the national unemployment rate is associated with a roughly three percentage point decrease in presidential approval.[18] Controlling for

[17]The ANES does not have vote choice in non-presidential election years, but we can construct an indicator of presidential approval from these data using party thermometer ratings. Unfortunately, due to the need to cluster standard errors, this does not provide enough power to examine the relationship between unemployment rates and party support. In particular, the standard errors are quite large, which has likely prevented previous studies from finding a statistically significant correlation between presidential support and local economic conditions.

[18]The dependent variable in this analysis is the average approval in state where approving equals 100,

national trends, an additional one percentage point state-level increase in unemployment is associated with roughly a 0.6 percentage point decrease in approval. Thus, similar to the results in Table 1, the independent correlation between state-level unemployment and approval is roughly 20% of the national-level correlation. Note also that the correlation between state unemployment and presidential approval is relatively consistent across all four presidencies we examine.

While there are many studies that find an effect of state economic performance on gubernatorial popularity and votes (for example: Hansen, 1999; Wolfers, 2002; Cohen and King, 2004), we believe we are the first to document an independent effect of state unemployment on presidential approval. In particular, these findings contrast with those that find contradictory results about the effect of local economic conditions in single elections (Abrams, 1980; Brunk and Gough, 1983; Abrams and Butkiewicz, 1995; Lacombe and Shaughnessy, 2007). The panel structure of our data allows us to control for persistent differences in partisanship across states. Moreover, this contrasts with previous studies that have found no effect of state unemployment on presidential vote share (Strumpf and Phillippe, 1999; Eisenberg and Ketcham, 2004) across time. Prior studies are hampered by the small sample size imposed by using vote shares over the relatively short period where disaggregated unemployment data is available. Our data provide greater statistical power to tease out the relative importance of national versus state economic conditions.

The two new stylized facts identified in Tables 1 and 2 support mecro-economic voting theory. However, the theory focuses on economic perceptions, which are largely unmeasured in time-series data. Thus, we turn to cross-sectional data on a specially designed survey question in order to more fully understand the extent to which economic perceptions match with those predicted by mecro-economic voting.

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.

5 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 most 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.[19] Of course, it is unlikely that no-one in our sample knows the national unemployment rate, and, moreover, that this knowledge will vary with an individual's media environment. Thus, in Section 5.2 we use variation in exposure to media as a further test of mecro-economic voting theory.[20]

5.1 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?

[19] This 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.

[20] The 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).

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. Note that in order to prevent unusually high responses from driving differences in the mean, we top code responses at 25% throughout.[21]

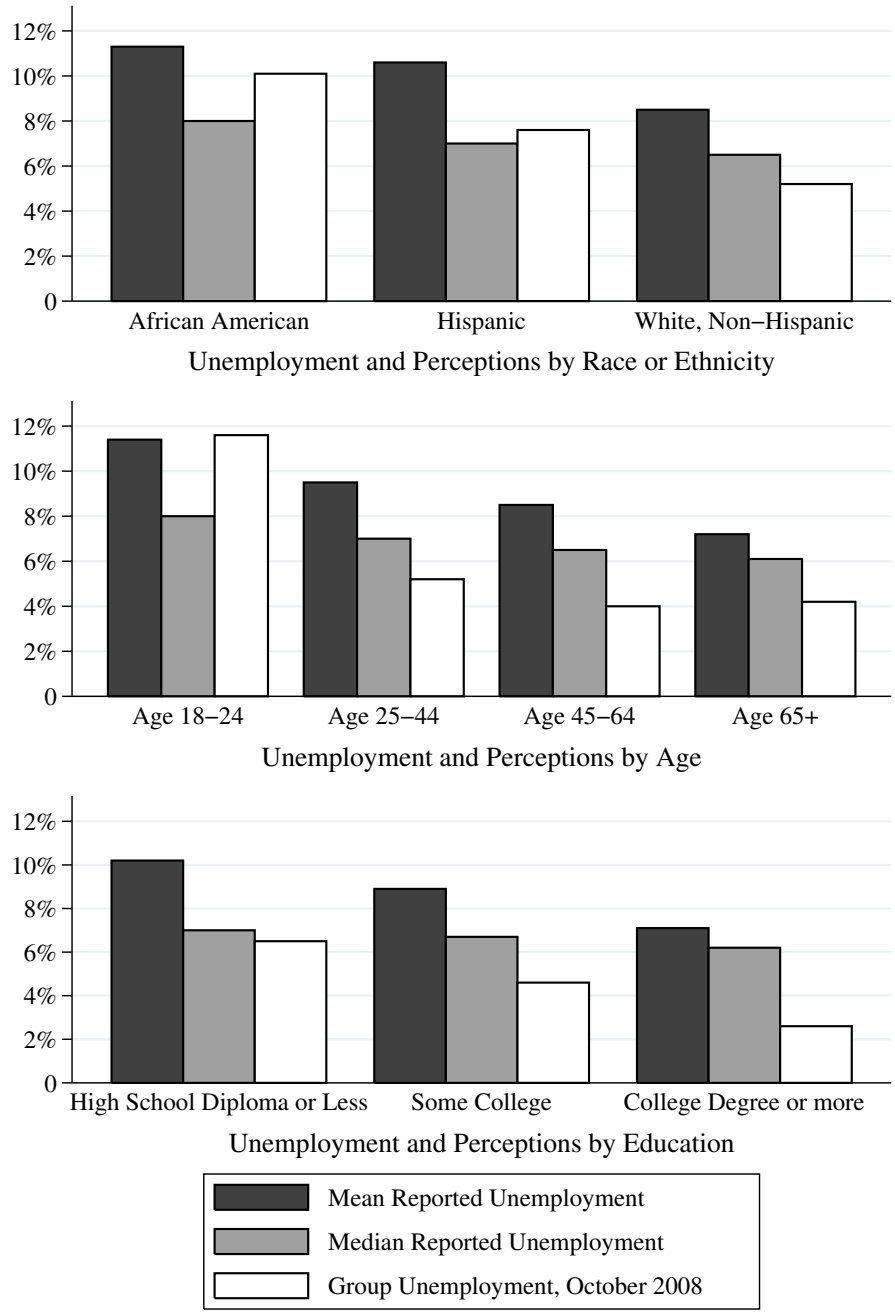
While Figure 1 is consistent with the pattern predicted by theory, one might worry that these perceptions are driven by other factors, such as partisanship. Focusing on age: perhaps younger people are more liberal, and the more liberal a person is, the higher he or she perceives unemployment to be. While it is unlikely that we could establish a causal relationship between a person's mecro-economic environment and his or her perception of unemployment rates, we can certainly control for observable correlates in more complete regression analyses.

Table 3 presents exactly these analyses. The second and fourth columns 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. Columns 1 and 3 contain a least absolute difference (LAD) specification, often referred to as a median regression. That is, 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. Consistent with Figure 1, the OLS coefficients (difference between means by group) are greater than the LAD coefficients (difference between medians by group).

The first pair of specifications in Table 3 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

[21]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.

the predicted patterns. To examine this possibility, the second pair of columns include each state's unemployment rate, rather than state fixed effects, in the regression.[22]

The coefficients in Table 3 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 3 with Table 4, 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 4. 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.[23]

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 then unmarried 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.[24] While anxiety about the economy may lead married men to exaggerate the unemployment rate as well as the threat of free trade, it seems more appropriate here to simply note that married men

[22]Including 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.

[23]Note 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. Moreover, while perceptions of unemployment by occupation or sector would likely be of great interest (Rehm, 2009, forthcoming), the CCES does not contain such data.

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

Table 3: Correlates of Reported Unemployment (CCES, N = 2,875)

Democrat	0.56***	1.26***	0.54***	1.22***
	(0.08)	(0.22)	(0.08)	(0.25)
Independent	0.33***	0.84***	0.30***	0.76***
	(0.07)	(0.20)	(0.08)	(0.18)
Age 18–24	0.90**	2.45***	0.79***	2.49***
	(0.41)	(0.55)	(0.15)	(0.55)
Age 25–44	0.52***	1.48***	0.47***	1.47***
	(0.10)	(0.24)	(0.09)	(0.25)
Age 45–64	0.18***	0.62***	0.18**	0.63***
	(0.06)	(0.20)	(0.08)	(0.17)
Married Male	0.23**	0.53**	0.18*	0.47***
	(0.10)	(0.22)	(0.09)	(0.16)
Unmarried Female	0.72***	2.26***	0.65***	2.22***
	(0.16)	(0.33)	(0.10)	(0.37)
Married Female	0.64***	2.10***	0.59***	2.07***
	(0.14)	(0.27)	(0.09)	(0.20)
African American	0.58**	1.85***	0.69***	1.93***
	(0.28)	(0.40)	(0.10)	(0.39)
Hispanic	-0.01	0.96***	0.10	1.01***
	(0.14)	(0.37)	(0.11)	(0.35)
Some College	-0.23**	-1.15***	-0.25***	-1.15***
	(0.10)	(0.23)	(0.07)	(0.26)
BA Degree	-0.30***	-1.54***	-0.33***	-1.56***
	(0.08)	(0.21)	(0.08)	(0.26)
Income < $20,000	0.92***	2.56***	0.80***	2.42***
	(0.30)	(0.49)	(0.14)	(0.52)
$20,000 < Income < $40,000	0.49***	1.10***	0.42***	1.03***
	(0.15)	(0.31)	(0.11)	(0.30)
$40,000 < Income < $80,000	0.06	0.41*	0.07	0.35*
	(0.07)	(0.23)	(0.10)	(0.20)
$80,000 < Income < $120,000	0.00	0.13	0.03	0.12
	(0.07)	(0.25)	(0.11)	(0.27)
Unemployed	0.20	1.15**	0.14	1.23***
	(0.20)	(0.49)	(0.12)	(0.45)
State Dummies	$F = 22.5$	$F = 1.39$		
	$p = 0.00$	$p = 0.04$		
State Unemployment Rate			0.11***	0.15**
			(0.02)	(0.07)
Constant	5.48***	5.65***	5.04***	4.41***
	(0.83)	(1.13)	(0.22)	(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 4: 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.

report unemployment rates inconsistent with theory.

While the results in Table 3 are consistent with respondents basing perceptions of the unemployment rate on information from their mecro-economies, two covariates in Table 3 provide the most direct evidence that respondents are using information from their surroundings. First, as shown in columns 3 and 4 of Table 3, a higher unemployment rate in a state is associated with a higher reported unemployment rate. Second, an individual's own

unemployment status is associated with a higher reported unemployment rate.[25]

5.2 Media Use and Perceptions

Mecro-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 makes information, in addition to that from an individual's mecro-economies, freely available. We leverage this fact to conduct two further tests that examine how access to information affect respondents' economic perceptions.

We expect that voters will report common perceptions of national economic conditions when information about the aggregate economy is freely available. As national television news often reports on the national unemployment rate, we expect to observe less heterogeneity in unemployment perceptions among those who report watching national television news. However, as national television news rarely discusses the price of gas, we expect that heterogeneity in perceptions of gas prices should be largely the same between those that do, and do not, watch national television news.

Table 5 confirms that these predicted patters 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 perceptions 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 mecro-economic voting theory.

Although perceptions of gas prices do not change with media exposure, 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 an respondent drove made his or her reported perceptions 0.8 cents more accurate. Similarly, each extra per week a respondent reported noticing gas prices induced

[25]The correlation between partisan identification and unemployment perceptions is explored in Ansolabehere, Meredith and Snowberg (2010).

Table 5: Correlates of Unemployment and Gas Prices by Media Environment

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

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 perception of the average price of gas.[26]

6 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, the Democrats. While the fact that this prediction holds is not particularly surprising, it is still important to carry our analysis of cross-sectional data through to political support.

We regress an indicator variable coded one if the respondent indicated he or she voted for 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 6.[27] Mecro-economic voting predicts that the coefficient on reported unemployment will be positive.

The first column of Table 6 shows that reported unemployment is significantly correlated with vote choice. However, as shown in Table 3, unemployment perceptions 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, demo-

[26]Consistent 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.

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

Table 6: Vote choice is correlated with unemployment perceptions.

Dependent Variable: Vote for Obama = 1, Vote for McCain = 0 (CCES, N=2,026)						
Reported Unemployment	0.017***	0.005**	0.003*			
	(0.002)	(0.002)	(0.002)			
Reported Unemployment (Report In Frame)				0.06***	0.012**	0.010*
				(0.01)	(0.006)	(0.006)
Below Frame				0.31	0.26	0.19
				(0.20)	(0.20)	(0.16)
Above Frame				0.60***	0.13***	0.10**
				(0.07)	(0.05)	(0.04)
Constant	0.40***	0.03**	0.10	0.11*	-0.02	0.05
	(0.02)	(0.01)	(0.09)	(0.06)	(0.03)	(0.10)
Party Identification (7 dummy variables)	No	Yes	Yes	No	Yes	Yes
All Other Controls (From Table 3)	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.

graphic factors may have a direct effect on voting. Thus, although including demographic controls will absorb much of the effect predicted by theory, they are necessary to avoid omitted variable bias. The third column of Table 3 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 above or below the historical unemployment rates, given in the survey question, were either not paying particular attention to the survey instrument, or have economic perceptions that significantly diverge from the average respondent. 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%, which we refer to in the table as the *frame*.[28] For

[28]The reported unemployment rate of those above and below the frame is coded as zero in Table 6. We could also drop these respondents from the analysis—this produces similar results. We maintain all respondents, as, in October 2008, there were areas (and groups) for which the unemployment rate was well above the historical high of the national rate, and thus, even a respondent paying close attention to the

those respondents who reported a level between 2.5% and 10.8%, reported unemployment enters the specification linearly, as in the first three columns.

In our preferred specification, column five of Table 6, an increase in perceived unemployment from the rate for college graduates (2.6%) to 15% (the rate in various areas of the rust belt in October 2008) results in a 15 percentage point increase in the probability that a respondent voted for Obama.[29] Thus, those respondents who believe that the unemployment rate is higher also were significantly more likely to vote against the incumbent party, as predicted.

7 Discussion: The Shifting Nature of Economic Voting

We have shown that perceptions of macro-economic conditions are correlated with mecro-economic conditions. Specifically, both aggregate retrospective economic evaluations from the ANES, and state-level presidential support from Gallup, vary with state unemployment rates after controlling for national trends. Moreover, data from the CCES shows that individuals who are members of groups that are more likely to be unemployed perceive higher unemployment rates, and are more likely to vote for presidential challengers. Thus, as voters are influenced by their mecro-economies, vote patterns are affected by the structure of the economy. This has particularly important implications for election forecasting.

The U.S. economy has changed in many ways since the inaugural studies of economic

survey may report a high unemployment rate.

[29] A one standard-deviation change in unemployment perceptions in this specification 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. Probit or logit specifications produce qualitatively similar results, but stronger support for mecro-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 $p = 0.0000$.

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).[30]

This brings us back to the Kramer (1983) critique of using individual level data to understand 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. Moreover, we have verified this finding using aggregate data. 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.

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

References

Abrams, Burton A. 1980. "The Influence of State-Level Economic Conditions on Presidential Elections." *Public Choice* 35(5):623–631.

Abrams, Burton A. and James L. Butkiewicz. 1995. "The Influence of State-Level Economic Conditions on the 1992 U.S. Presidential Election." *Public Choice* 85(1/2):1–10.

Alvarez, R. Michael. 1997. *Information and Elections*. Ann Arbor, Michigan: University of Michigan Press.

Alvarez, R. Michael and Charles H. Franklin. 1994. "Uncertainty and Political Perceptions." *The Journal of Politics* 56(3):671–688.

Alvarez, R. Michael and John Brehm. 2002. *Hard Choices, Easy Answers: Values, Information, and American Public Opinion*. Princeton, New Jersey: Princeton University Press.

Anderson, Christopher J., Raymond M. Duch and Harvey D. Palmer. 2000. "Heterogeneity in Perceptions of National Economic Conditions." *American Journal of Political Science* 44(4):635–652.

Anderson, Christopher J., Silvia M. Mendes and Yuliya V. Tverdova. 2004. "Endogenous Economic Voting: Evidence from the 1997 British Election." *Electoral Studies* 23(4):683–708.

Ansolabehere, Stephen, Marc Meredith and Erik Snowberg. 2010. "Asking About Numbers: Why and How." Presented at the annual meeting of the Midwest Political Science Association. The Palmer House Hilton.

Ansolabehere, Stephen, Marc Meredith and Erik Snowberg. 2011. Sociotropic Voting and the Media. In *The ANES Book of Ideas*, ed. John H. Aldrich and Kathleen McGraw. Princeton University Press.

Bartels, Larry M. 1986. "Issue Voting under Uncertainty: An Empirical Test." *American Journal of Political Science* pp. 709–728.

Besley, Timothy and Stephen Coate. 1997. "An Economic Model of Representative Democracy." *Quarterly Journal of Economics* 112(1):85–114.

Bloom, Howard S. and H. Douglas Price. 1975. "Voter Response to Short-Run Economic Conditions: The Asymmetric Effect of Prosperity and Recession." *The American Political Science Review* 69(4):1240–1254.

Books, John and Charles Prysby. 1999. "Contextual Effects on Retrospective Economic Evaluations the Impact of the State and Local Economy." *Political Behavior* 21(1):1–16.

Brunk, Gregory G. and Paul A. Gough. 1983. "State Economic Conditions and the 1980 Presidential Election." *Presidential Studies Quarterly* 13(1):62–69.

Clarke, Harold D. and Marianne C. Stewart. 1994. "Prospections, Retrospections, and Rationality: The 'Bankers' Model of Presidential Approval Reconsidered." *American Journal of Political Science* 38(4):1104–1123.

Cohen, Jeffrey E. and James D. King. 2004. "Relative Unemployment and Gubernatorial Popularity." *The Journal of Politics* 66(4):1267–1282.

Conover, Pamela Johnstone, Stanley Feldman and Kathleen Knight. 1986. "Judging Inflation and Unemployment: The Origins of Retrospective Evaluations." *The Journal of Politics* 48(3):565–588.

Downs, Anthony. 1957. *An Economic Theory of Democracy*. New York, NY: Harper Collins.

Duch, Raymond. and David Armstrong. 2010. "Comparing the Effect of Economic Attitudes and the Real Economy on Vote Choice." *Paper presented at the annual meeting of the Midwest Political Science Association 67th Annual National Conference, The Palmer House Hilton, Chicago, IL* .

Duch, Raymond M. and Harvey D. Palmer. 2002. Heterogenous Perceptions of Economic Conditions in Cross-National Perspective. In *Economic Voting*, ed. Han Dorussen and Michaell Tayloer. Routledge pp. 139–172.

Duch, Raymond M. and Randolph T. Stevenson. 2008. *The Economic Vote: How Political and Economic Institutions Condition Election Results*. Cambridge University Press.

Egan, Patrick J. and Megan Mullin. 2010. "Turning Personal Experience into Political Attitudes: The Effect of Local Weather on Americans Perceptions about Global Warming." Temple University, *mimeo*.

Eisenberg, Daniel and Jonathan Ketcham. 2004. "Economic voting in US presidential elections: Who blames whom for what." *Topics in Economic Analysis and Policy* 4(1):1–23.

Erikson, Robert S., Michael B. MacKuen and James A. Stimson. 2002. *The Macro Polity*. Cambridge, UK: Cambridge University Press.

Evans, Geoffrey and Mark Pickup. 2010. "Reversing the Causal Arrow: The Political Conditioning of Economic Perceptions in the 2000-2004 U.S. Presidential Election Cycle." *The Journal of Politics* 72(4):1236–1251.

Evans, Geoffrey and Robert Andersen. 2006. "The Political Conditioning of Economic Perceptions." *The Journal of Politics* 68(1):194–207.

Fair, Ray C. 1978. "The Effect of Economic Events on Votes for President." *The Review of Economics and Statistics* 60(2):159–173.

Fair, Ray C. 2006. "The Effect of Economic Events on Votes for President: 2006 Update." Yale University, *mimeo*.

Fiorina, Morris P. 1981. *Retrospective Voting in American National Elections*. New Haven, CT: Yale University Press.

Gomez, Brad T. and J. Matthew Wilson. 2001. "Political Sophistication and Economic Voting in the American Electorate: A Theory of Heterogeneous Attribution." *American Journal of Political Science* 45(4):899–914.

Gomez, Brad T. and J. Matthew Wilson. 2003. "Causal Attribution and Economic Voting in American Congressional Elections." *Political Research Quarterly* 56(3):271–282.

Gomez, Brad T. and J. Matthew Wilson. 2006. "Cognitive Heterogeneity and Economic Voting: A Comparative Analysis of Four Democratic Electorates." *American Journal of Political Science* 50(1):127–145.

Haller, H. Brandon and Helmut Norpoth. 1994. "Let the Good Times Roll: The Economic Expectations of US Voters." *American Journal of Political Science* 38(3):625–650.

Haller, H. Brandon and Helmut Norpoth. 1997. "Reality Bites: News Exposure and Economic Opinion." *Public Opinion Quarterly* 61(4):555–575.

Hansen, Susan B. 1999. "Life Is Not Fair: Governors' Job Performance Ratings and State Economies." *Political Research Quarterly* 52(1):167–188.

Hetherington, Marc J. 1996. "The Media's Role in Forming Voters' National Economic Evaluations in 1992." *American Journal of Political Science* 40(2):372–395.

Hibbs, Douglas A. 2006. Voting and the Macroeconomy. In *The Oxford Handbook of Political Economy*, ed. Barry R. Weingast and Donald A. Witman. Oxford University Press chapter 31, pp. 565–586.

Hiscox, Michael J. 2006. "Through a Glass and Darkly: Attitudes Toward International Trade and the Curious Effects of Issue Framing." *International Organization* 60(3):755–780.

Holbrook, Thomas and James C. Garand. 1996. "Homo Economus? Economic Information and Economic Voting." *Political Research Quarterly* 49(2):351–375.

Hopkins, Daniel J. 2011. "Whose Economy? Perceptions of National Economic Performance During Unequal Growth." Georgetown. *mimeo.*

Kahneman, Daniel and Amos Tversky. 1974. "Judgment under Uncertainty: Heuristics and Biases." *Science* 185(4157):1124–1131.

Karol, David and Edward Miguel. 2008. "The Electoral Cost of War: Iraq Casualties and the 2004 US Presidential Election." *The Journal of Politics* 69(3):633–648.

Kiewiet, D. Roderick. 1983. *Macroeconomics and Micropolitics.* The University of Chicago Press.

Kiewiet, D. Roderick and M. Udell. 1998. "Twenty-five Years after Kramer: An Assessment of Economic Retrospective Voting based upon Improved Estimates of Income and Unemployment." *Economics & Politics* 10(3):219–248.

Kinder, Donald R. and D. Roderick Kiewiet. 1979. "Economic Discontent and Political Behavior: The Role of Personal Grievances and Collective Economic Judgments in Congressional Voting." *American Journal of Political Science* 23(3):495–527.

Kinder, Donald R. and D. Roderick Kiewiet. 1981. "Sociotropic Politics: The American Case." *British Journal of Political Science* 11(2):129–161.

Kinder, Donald R., Gordon S. Adams and Paul W. Gronke. 1989. "Economics and Politics in the 1984 American Presidential Election." *American Journal of Political Science* 33(2):491–515.

Kramer, Gerald H. 1971. "Short-Term Fluctuations in US Voting Behavior, 1896-1964." *The American Political Science Review* 65(1):131–143.

Kramer, Gerald H. 1983. "The Ecological Fallacy Revisited: Aggregate-versus Individual-level Findings on Economics and Elections, and Sociotropic Voting." *The American Political Science Review* 77(1):92–111.

Krause, George A. 1997. "Voters, Information Heterogeneity, and the Dynamics of Aggregate Economic Expectations." *American Journal of Political Science* 41(4):1170–1200.

Lacombe, Donald J. and Timothy M. Shaughnessy. 2007. "Accounting for Spatial Error Correlation in the 2004 Presidential Popular Vote." *Public Finance Review* 35(4):480–499.

Lewis-Beck, Michael S. 1988. *Economics and Elections: The Major Western Democracies*. Ann Arbor: The University of Michigan Press.

Lewis-Beck, Michael S. 2006. "Does Economics Still Matter? Econometrics and the Vote." *Journal of Politics* 68(1):208–212.

Lewis-Beck, Michael S. and Martin Paldam. 2000. "Economic Voting: An Introduction." *Electoral Studies* 19(2-3):113–121.

Luskin, Robert C. 1987. "Measuring Political Sophistication." *American Journal of Political Science* 31(4):856–899.

MacKuen, Michael B., Robert S. Erikson and James A. Stimson. 1992. "Peasants or Bankers? The American Electorate and the US Economy." *The American Political Science Review* 86(3):597–611.

Mueller, John E. 1970. "Presidential Popularity from Truman to Johnson." *The American Political Science Review* 64(1):18–34.

Mutz, Diana C. 1992*a*. "Impersonal Influence: Effects of Representations of Public Opinion on Political Attitudes." *Political Behavior* 14(2):89–122.

Mutz, Diana C. 1992*b*. "Mass Media and the Depoliticization of Personal Experience." *American Journal of Political Science* 36(2):483–508.

Mutz, Diana C. 1993. "Direct and Indirect Routes to Politicizing Personal Experience: Does Knowledge Make a Difference?" *Public Opinion Quarterly* 57(4):483–502.

Mutz, Diana C. 1994. "Contextualizing Personal Experience: The Lole of Mass Media." *The Journal of Politics* 56(3):689–714.

Mutz, Diana C. and Jeffrey J. Mondak. 1997. "Dimensions of Sociotropic Behavior: Group-Based Judgements of Fairness and Well-Being." *American Journal of Political Science* 41(1):284–308.

Osborne, Martin J. and Al Slivinski. 1996. "A Model of Political Competition with Citizen-Candidates." *The Quarterly Journal of Economics* 111(1):65–96.

Palmer, Harvey D. and Raymond M. Duch. 2001. "Do Surveys Provide Representative or Whimsical Assessments of the Economy?" *Political Analysis* 9(1):58–77.

Popkin, Samuel L. 1991. *The Reasoning Voter: Communication and Persuasion in Presidential Campaigns*. Chicago: University of Chicago Press.

Reeves, Andrew and James G. Gimpel. 2011. "Ecologies of Unease: Geographic Context and National Economic Evaluations." *Political Behavior* it Forthcoming.

Rehm, Phillip. 2009. "Risks and Redistribution." *Comparative Political Studies* 42(7):855–881.

Rehm, Phillip. forthcoming. "Risk Inequality and the Polarized American Electorate." *British Journal of Political Science* .

Rudolph, Thomas J. 2003. "Who's Responsible for the Economy? The Formation and Consequences of Responsibility Attributions." *American Journal of Political Science* 47(4):698–713.

Scheve, Kenneth and Matthew J. Slaughter. 2004. "Economic insecurity and the globalization of production." *American Journal of Political Science* 48(4):662–674.

Scheve, Kenneth and Matthew J. Slaughter. 2006. Public Opinion, International Economic Integration, and the Welfare State. In *Globalization and Egalitarian Redistribution*, ed. Samuel Bowles, Pranab Bardhan and Michael Wallerstein. Princeton, NJ: Princeton University Press chapter 9, pp. 217–260.

Strumpf, Koleman S. and John R. Phillippe. 1999. "Estimating Presidential Elections: The Importance of State Fixed Effects and the Role of National Versus Local Information." *Economics and Politics* 11(1):33–50.

van der Brug, Wouter, Cees van der Eijk and Mark Franklin. 2007. *The Economy and the Vote: Economic Conditions and Elections in Fifteen Countries*. Cambridge University Press.

Weatherford, M. Stephen. 1983*a*. "Economic Voting and the 'Symbolic Politics' Argument: A Reinterpretation and Synthesis." *American Political Science Review* 77(1):158–174.

Weatherford, M. Stephen. 1983*b*. "Evaluating Economic Policy: A Contextual Model of the Opinion Formation Process." *Journal of Politics,* 45(4):866–888.

Wlezien, Christopher, Mark Franklin and Daniel Twiggs. 1997. "Economic Perceptions and Vote Choice: Disentangling the Endogeneity." *Political Behavior* 19(1):7–17.

Wolfers, Justin. 2002. "Are Voters Rational? Evidence from Gubernatorial Elections." Stanford GSB Working Paper #1730.

Zaller, John. 1992. *The Nature and Origins of Mass Opinion.* Cambridge, UK: Cambridge University Press.

Zaller, John and Stanley Feldman. 1992. "A Simple Theory of the Survey Response: Answering Questions versus Revealing Preferences." *American Journal of Political Science* 36(3):579–616.

Appendix

A.1 Formalization of Sections 2 and 3

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 $\left(0, \frac{\varepsilon+w}{2}\right)$ if the individual is employed in the first period, and $\left(0, \frac{\varepsilon}{2}\right)$ 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 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 unemployment rate $\sigma_{R^i} \in \{0,1\}$ in his mecro-economy, where one indicates a high unemployment rate, and zero a low unemployment rate. Signals are correlated with personal unemployment rates in the following way: $P(\sigma_{R^i}=0|R=L) = \rho = P(\sigma_{R^i}=1|R=H)$, where $\rho > \frac{1}{2}$.[31] 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* **precise** *than signal k if:*

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

Thus, a binary signal is more precise 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 precise signals are more valuable.*

[31] This implies

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

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

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

Assumption 1 *We assume that*

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

Using personal unemployment rates of $H = 10\%$ and $L = 5\%$, this means that (1) holds when $\rho > \frac{2}{3}$. That is to say, employment status is a less precise signal than knowing 10% of your profession is unemployed if, when 10% of your profession 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^i} *is more precise than* σ_E.

While the individual will observe σ_E, they will likely have to seek out σ_{R^i}. This last fact tells us that as long as the cost of seeking out σ_{R^i} is low, the individual will do so. Moreover, to the extent that the national unemployment rate is less precise than a mecro-economic unemployment rate, fewer individuals will seek out this signal at the same cost.

The individual can thus use both his personal employment status σ_E and the unemployment rate of his mecro-economy σ_{R^i} to inform his (sincere) vote. If both the mecro-economic 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 the mecro-economic 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 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 his mecro-economy. That is, $P(\sigma_E = e \cap \sigma_{R^i} = r|R) = P(\sigma_E = e|R) * P(\sigma_{R^i} = r|R)$.

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

As we argue in the text, some individuals will choose to become informed about the national unemployment rate in addition to their mecro-economic unemployment rate. This could be formalized here by assuming that each person has a cost of acquiring information that is an i.i.d. draw from some distribution. As argued in the text, an individual's mecro-economic unemployment rate is a more precise signal than the national unemployment rate, so this would mean that there is some subset of people who would pay the cost to acquire information about the national unemployment rate, but this group of people would be smaller than those who acquire information about their mecro-economic unemployment rate. Thus, we do not formalize this here as the implications are straight-forward, and it would require substantially more notation.

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

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

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, $s^* \in \left(0, \frac{\varepsilon+\mathbb{I}_E w}{2}\right)$. ■

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). Recall that the individual has a prior belief π that his personal unemployment rate will be high. Recall further that we defined the signal that results in a higher posterior probability of the individual's per-

sonal unemployment rate being high as $\sigma = L$, the signal that results in a lower posterior probability of the individual's personal unemployment rate being high as $\sigma = H$. Here we denote $P = \text{Prob}(\sigma = L)$.

Voters use Bayesian updating to determine the expected unemployment rate after getting a signal. Recalling $\pi(j) \equiv \text{Prob}(R{=}H|\sigma{=}j)$, and using the martingale property of Bayesian updating, we have that

$$\pi = P\pi(L) + (1-P)\pi(H)$$

which, defining the expected unemployment rate $R(j) \equiv (1-\pi(j))L + \pi(j)H$, as a function of belief $\pi(j)$, implies

$$R(\pi) = PR(L) + (1-P)R(H) \tag{5}$$

as there is a one-to-one mapping between posterior probabilities and posterior expected personal unemployment rates, we can think of a signal as having three characteristics, P, $R(L)$, and $R(H)$, where, according to (5) any two of these characteristics define the third. By definition $\pi(L) < \pi < \pi(H)$, which implies $R(L) < R(\pi) < R(H)$. Define s_j^* as the optimal level of savings when the individual receives a realized signal $\sigma = j$. Using (4) we have $s_L^* < s^* < s_H^*$.

An individual values a signal because it allows him to better optimize his savings rate s^*. The value of a particular realization of the signal can be defined as $V(\sigma{=}j) = U(s_j^*|R(j)) - U(s^*|R(j))$. Thus, the total expected value of a signal is

$$V(\sigma) = PV(\sigma = L) + (1-P)V(\sigma = H). \tag{6}$$

and we will examine how this value changes with the precision of the signal.

Reframing Definition 1: σ^1 is more precise than σ^2 if $|L - R(\sigma^1{=}L)| \leq |L - R(\sigma^2{=}L)|$ and $|H - R(\sigma^1{=}H)| \leq |H - R(\sigma^2{=}H)|$, with at least one strict inequality. To determine if a more precise signal is indeed more valuable, we will examine how the value of the signal changes with changes in the characteristics of a signal. However, as noted above, changing

one characteristic of the signal (P, $R(L)$, and $R(H)$) necessitates a change in at least one of the other characteristics so that (5) will continue to hold. Thus, we examine the three changes in pairs of these variables holding the third constant. As any change can be represented by some combination of these three changes, this is the same as investigating the basis of any change.[32]

The first change is to increase the value of $R(H)$, while fixing P. This will require a compensating decrease in $R(L)$ to maintain the equality in (5). That is

$$\begin{aligned}
\frac{dV(\sigma)}{dR(H)} &= P\frac{dV(\sigma=L)}{dR(H)} + (1-P)\frac{dV(\sigma=H)}{dR(H)} \\
&= P\left[\frac{dU(s_L^*|R(L))}{dR(L)} - \frac{dU(s^*|R(L))}{dR(L)}\right]\frac{dR(L)}{dR(H)} + (1-P)\left[\frac{dU(s_H^*|R(H))}{dR(H)} - \frac{dU(s^*|R(H))}{dR(H)}\right] \\
&= P\left[\int_{s_L^*}^{s^*}\int_0^w u''(y+x)dy\,dx\right]\frac{dR(L)}{dR(H)} + (1-P)\left[-\int_{s^*}^{s_H^*}\int_0^w u''(y+x)dy\,dx\right]
\end{aligned}$$

where the second line follows from the chain rule, and $\int_{s_L^*}^{s^*}\int_0^w u''(y+x)dy\,dx < 0$ due to the concavity of u. Note that within each square bracket the first derivative is made simpler by the envelope theorem, and the second is zero as s^* is fixed. Re-arranging (5) yields $R(L) = \frac{R(\pi)-(1-P)R(H)}{P}$, so

$$\frac{dR(L)}{dR(H)} = \frac{P-1}{P} < 0, \tag{7}$$

and thus, $\frac{dV(\sigma)}{dR(H)} > 0$. Note that (7) is negative, as expected.

A second change is to increase P while fixing $R(L)$. This implies an increase in $R(H)$,

[32]Mathematically, this is a derivative on a three dimensional surface, and the pairwise changes establish changes along a set of basis vectors. Changes in all three variables simultaneously are combinations of changes along these basis vectors. For simplicity, we avoid vector calculus notation.

$\frac{dR(H)}{dP} = \frac{R(H)-R(L)}{1-P} > 0$. Now

$$\begin{aligned}
\frac{dV(\sigma)}{dP} &= U(s_L^*|R(L)) - U(s^*|R(L)) - \big[U(s_H^*|R(H)) - U(s^*|R(H))\big] + (1-P)\frac{dV(\sigma=H)}{dR(H)} * \frac{dR(H)}{dP} \\
&= u(w-s_L^*) + R(L)u(s_L^*) + (1-R(L))u(w+s_L^*) - \\
&\qquad \Big(u(w-s_H^*) + R(L)u(s_H^*) + (1-R(L))u(w+s_H^*)\Big) \\
&= U(s_L^*|R(L)) - U(s_H^*|R(L)) > 0
\end{aligned}$$

where the second line follows from expanding $V(\cdot)$ and $U(\cdot)$ into component $u(\cdot)$ terms, and canceling, the third line follows from the definition of $U(\cdot)$, and the inequality follows from the definition of s_L^*.

A final change is to increase $R(L)$ while fixing $R(H)$. This implies an increase in P, $\frac{dP}{dR(L)} = \frac{P}{R(H)-R(L)} > 0$. The effect of this final change is:

$$\begin{aligned}
\frac{dV(\sigma)}{dR(L)} &= P\frac{dV(\sigma=L)}{dR(L)} + \big(V(\sigma=L) - V(\sigma=H)\big)\frac{dP}{dR(L)} \\
&= \frac{P}{R(H)-R(L)}\left[\frac{dV(\sigma=l)}{dR(L)}\big(R(H)-R(L)\big) + V(\sigma=L) - V(\sigma=H)\right] \\
&= \frac{P}{R(H)-R(L)}\Big[u(w-s_L^*) + R(H)u(s_L^*) + (1-R(H))u(w+s_L^*) - \\
&\qquad \big[u(w-s_H^*) + R(H)u(s_H^*) + (1-R(H))u(w+s_H^*)\big]\Big] \\
&= \frac{P}{R(H)-R(L)}\big[U(s_L^*|R(H)) - U(s_H^*|R(H))\big] < 0
\end{aligned}$$

where, once again, the third line follows from expanding $V(\cdot)$ and $U(\cdot)$ into component $u(\cdot)$ terms, and canceling, the fourth line follows from the definition of $U(\cdot)$, and the inequality follows from the definition of s_H^*.

Note that in all three of these changes, an decrease in $|H - R(H)|$ or $|L - R(L)|$ is associated with an increase in the value of the signal. Thus, more precise signals are more valuable. ■

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

$$\frac{\rho}{1-\rho} > \frac{H}{L} > \frac{1-L}{1-H}. \tag{8}$$

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

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

Using the second inequality in (1) we have

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

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

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

$$\frac{\pi(1-\rho)(1-L)}{(1-\pi)\rho(1-H) + \pi(1-\rho)(1-L)} < \pi \iff \rho > \frac{1-L}{2-L-H}. \tag{9}$$

which is assumed to be true as in (8). If, instead, the individual is unemployed, but the unemployment rate is low, then the individual will vote for the incumbent when

$$\frac{\pi\rho L}{\pi\rho L + (1-\pi)(1-\rho)H} > \pi \iff \rho > \frac{H}{L+H}, \tag{10}$$

which is satisfied whenever (1) is true. ■