Online Appendix: Robustness Tests and Migration

Means

Online Appendix Table 1 presents the summary statistics of turnout for the five types of elections studied in the paper in the the oil and coal state sample, over the period of the boom and bust studied in the TSLS analysis.

Instrument Specifications

Online Appendix Table 2 shows estimates for the TSLS estimates for the statewide elections, using alternative definitions of the instrument. Two results are shown. We use changes in coal and oil price instead of changes in national employment in oil and coal. Also, the main specification defines the importance of oil and coal production in a county using CBP data from 1974, which is the earliest years for which two-digit data are available. Because these 1974 numbers might partly reflect endogenous responses to oil shocks (the first of which occurred in 1972/73), in the robustness test we use one-digit 1967 CBP data to create an alternative measure of the importance of county oil and coal employment. As the table shows our results are robust to these alternative ways of defining the instrument.

Larger Spatial Areas

In another robustness exercise, we estimate OLS difference models similar to (2) in the paper, but use data for geographic areas larger than counties: State Economic Areas (SEA) and Economic Sub Regions (ESR). SEAs are aggregate economic units originally developed for the 1950 Census which consist of either a single county or a set of contiguous counties which do not cross state lines (Bogue 1951), and ESRs are aggregations of SEAs. Most states have between 6 to 11 times the number of SEAs as counties. In these models, we do not use TSLS so there is no concern that the results are contaminated by any potential failure of the exclusion restriction in those models (the possibility that energy shocks changed voting through mechanism other than labor market activity). At the same time, data from these larger geographic areas are likely to be less contaminated by measurement error problems, which is one of the key problems the TSLS models are intended to address. Also, since SEAs and ESRs are subsumed within states, OLS models using these data can control for state$\times$year fixed effects, which we have shown to be important determinants of turnout. A limitation of OLS models performed on these larger geographic units is that it is not possible for formally account for the various local (county-specific) unobserved factors, δ_c, that clearly affect turnout. Despite these concerns, it is instructive to see how OLS regressions based on data from larger geographic areas compare to our preferred TSLS county-level results. Online Appendix Table 3 shows these results. On the whole, even

though the results are somewhat more imprecise, using this more aggregated data to estimate OLS difference models with state×year fixed effects yield results broadly consistent with the state-wide results in the paper: negative effects on turnout of labor market activity in gubernatorial and senatorial elections, but presidential turnout that is either unaffected or slightly increased, by changes in labor market activity.

Migration

An important consideration that might affect the causal interpretation we place on the results in the paper is transitory internal migration associated with local economic shocks. Suppose that migrants sort temporarily into areas where labor market conditions are improving. Suppose further that migrants do not vote in elections dominated by local concerns because they are either unfamiliar with those concerns or regard them as irrelevant, given their temporary residence in the area. Finally, suppose that migrants continue to vote in elections whose outcomes are relevant to them wherever they live in the future. Local labor market activity and voter turnout would then be negatively related in gubernatorial or senatorial elections, the outcomes of which are relevant only for people who are from or plan to live in the state in the future. At the same time, these same variables might exhibit no systematic relationship to turnout in presidential elections, about which voters are presumably interested wherever in the country they live. In this scenario, the TSLS estimates could be identifying the effect of migration associated with energy shocks rather than how labor market activity changes turnout among a given set of voters.

We estimate negative effects of labor market activity on turnout for gubernatorial and senatorial elections. For these two elections, the migration concern is important only insofar as migration is from *outside* the state; migrants across different counties within a state presumably care about the outcomes of these two state-wide elections. Fortunately, we can study within- and out-of-state migration over the period of the energy price shocks.

The interval of what we have called the energy "boom" and "bust" over which the TSLS results are estimated is approximately 1970 to 1990. This is fortunate, as we can use the question from the 1970, 1980 and 1990 Censuses about where the respondent lived five years previously to determine how the share of the population new to a county changed across oil and coal counties over the energy "boom" (1970-1980) and "bust" (1980-1990) periods. These measures are available at the county-level in Census summary files. The first two columns in Online Appendix Table 4 show how the share of residents who had lived in a different county five years previously changed differentially in large and medium, compared to small counties. We find that during the boom, large and medium coal and oil producing counties experienced increases in the share of their residents who had lived in a different county five years previously, and that these counties experienced a reduction in the share of such persons during the period of

the energy bust. Again, these estimates represent comparisons to small producing counties - precisely the comparisons on which the TSLS estimates are based.

The results in the second pair of columns, which examine the change in the share of a county's residents who lived in another *state* five years previously, reveal a different pattern. We find that during the energy boom there was no statistically significant change in oil or coal counties' shares of out of state residents compared to changes in small producing counties. And, the reduction in the share of state migration during the bust was only a fraction of the overall relative reduction in the share of persons who from another county. Thus, whereas the energy supply shocks did indeed occasion greater in- and out-migration into the "large" and "medium" oil and coal producing counties compared to "small" ones, the overwhelming majority of that relative migration difference involved people from *within* the state. Given this, and presuming that all residents of a state have an interest in state-wide elections irrespective of which county they live in, these results suggest that the negative gubernatorial county results are not driven by migration.

We can bound the possible effect of migration on the TSLS turnout estimates over the boom (when there was no relative out of state migration difference into small, medium and large counties) and bust (when the statistically significant out-of-state migration differences are small). Suppose we make the unrealistic assumption that all out of state migrants into a county do not vote in gubernatorial elections because they did not know or care about these elections in the state to which they move. The results imply that of the 6.3 estimated percentage point change in turnout over the boom/bust cycle in large oil counties from the TSLS estimates, at most only 1.7 percentage points is attributable to migration. Similarly, for large and medium coal states, observed changes in migration cannot explain more than one-third of the 3.3 percentage point swing in gubernatorial turnout arising from changes in labor market activity over the boom/bust cycle in large or medium coal counties.

Unfortunately, we have no data on migration across congressional districts so cannot similarly bound the role of migration on the results in elections for the Congress and State House.

Online Appendix: Suggestive Evidence from the ANES

We conclude our ANES analysis with some simple associational patterns that have not been presented in previous work, as far as we know. The results do not directly test the argument relating labor supply to information, media exposure and turnout but they provide some corroboration of it. The first bit of evidence examines the associational relationship between reported turnout, information and partisanship. Formal definitions of partisanship (Achen 2005) and intuition suggest that the more strongly a person identifies with a given political party the less likely he is to modify his relative preferences over candidates in the face of objective information about politics; candidates' party identification effectively becomes all he needs to know to determine which candidate he most prefers. This implies that, while there should be a negative relationship between reported turnout and how informed the person is judged by an objective observer, the negative gradient should be larger for political moderates compared to more strongly partisan voters.

ANES respondents report their political partisanship in a series of questions which are translated to a seven point scale, ranging from "Strong Democrat"=1, "Independent"=4, through "Strong Republican"=7. The two graphs in Online Appendix Figure 1 show the share of respondents who reported having voted in the election, by the respondent's self-reported partisanship and by their levels of interviewer-assessed political knowledge and media exposure. The top two lines in each figure are the average reported turnout rate for informed and uninformed persons of the given partisanship type; the bottom line in each graph shows the difference in these two means, with 95% confidence interval bands. The figure shows that better informed persons of each partisanship type were more likely to vote, by between 1.3 and 3.2 statistically significant percentage points. The graphs also show that moderates are more sensitive to political information: the gap in turnout between informed and un-informed moderates is statistically larger than the corresponding gap for voters at the extremes of the partisanship distribution. These results are subject to the concerns we have raised about the reliability of reported turnout, but they are consistent with an information based account of voting.

The second piece of associational evidence provides some individual-level corroboration for the argument we have made for why voting in presidential elections (unlike other contests) may not affected by labor market activity. We have argued that this result makes sense in the context of an information-based model of voting if peoples' knowledge about presidential contests is vastly superior to that for other elections, and if it is so close to perfect that less exposure to political information has scant effect on what people know. We can test this argument directly.

For different types of elections over several survey years, ANES respondents are asked to rate the candidates in the previous election contest. This "thermometer" scale ranges from 0 to 100. We categorize respondents as not being able to

"recall" a given candidate if when answering this question they either do not recognize the candidate's name or they state that they cannot judge the candidate. Valid numeric responses are categorized as "recalling" the candidate. This is the only available measure of information differences across different types of elections and is available for multiple election types beginning in 1978. It is admittedly quite coarse and is not elicited for gubernatorial elections. These shortcomings notwithstanding, we find that the share of respondents who can recall both candidates is 97%, 66% and 45%, respectively, for presidential, Senate and House elections. Reassuringly, as we argued in the county turnout analysis, ignorance about candidates falls the more "note-worthy" (meaning, the likely more intensely covered) the election.

Online Appendix Table 1. Mean Turnout from 1969-1990, by Election Type, Across Coal and Oil States in U.S. (Standard Deviations in Parentheses).

	"State-Wide" Elections			"Local" Elections	
	President (4-Year Cycle)	**Governor** (4-Year Cycle)	**Senator** (6-Year Cycle)	**U.S. Congress** (2-Year Cycle)	**State Legislator** (2-Year Cycle)
Mean Turnout					
All Years	0.556	0.417	0.459	0.424	0.398
	(.079)	(.113)	(.115)	(.146)	(.135)
Presidential Years		0.641	0.530	0.508	0.453
		(.091)	(.082)	(.108)	(.118)
Non-Presidential Years		0.400	0.398	0.355	0.338
		(.094)	(.103)	(.136)	(.127)
Number of Elections, all Years	70	76	104	135	58
Number of elections in Presidential years		20	48	60	28
Percent of elections in Presidential years		0.26	0.46	0.44	0.48

Data drawn from multiple sources on aggregate voting data. See Data Appendix for details.
Sample means and standard deviations are weighted by number of adults.

Online Appendix Table 2. TSLS Estimates of *Change* in County Labor Market Outcomes on *Change* in Voter Turnout under Alternative Specifications of Oil and Coal Shock Instruments in "Oil" and "Coal" States.

	Governor		Senate		President	
	Endogenous Regressor		*Endogenous Regressor*		*Endogenous Regressor*	
	Δ County Log per Capita Annual Earnings	Δ County Log Employment per Adult	Δ County Log per Capita Annual Earnings	Δ County Log Employment per Adult	Δ County Log per Capita Annual Earnings	Δ County Log Employment per Adult
Instrument Specification:						
1. (Δ National Coal/Oil Employment) X	-.066	-.113	-.042	-.079	.042	.078
I("medium", "large" Oil/Coal 1967)	(.026)	(.064)	(.022)	(.087)	(.024)	(.057)
F-Stat on Excluded Instuments	17.4	49.1	13.3	44.3	6.2	29.8
2. (Δ Coal/Oil Price) X	-.171	-.352	-.044	-.099	.050	.113
I("medium", "large" Oil/Coal 1974)	(.029)	(.080)	(.046)	(.134)	(.048)	(.114)
F-Stat on Excluded Instuments	27.8	38.0	13.7	27.7	15.6	87.2
3. (Δ Oil/Coal Price) X	-.157	-.286	-.027	-.078	.068	.137
I("medium", "large" Oil/Coal 19**67**)	(.033)	(.077)	(.036)	(.078)	(.032)	(.073)
F-Stat on Excluded Instuments	19.4	35.3	16.3	15.0	15.1	47.5
4. (Δ National Coal/Oil Employment) X	-.118	-.271	-.028	-.065	.023	.055
Continuous Measure of Coal/Oil	(.048)	(.119)	(.037)	(.098)	(.019)	(.040)
Employment Share in 1974	32.6	22.9	28.8	66.7	14.3	130.7
F-Stat on Excluded Instuments						
State*Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4751	4751	6014	6014	4412	4412

Each point estimate in the table represents results from a different regression.
Standard errors account for arbitrary forms of clustering within states.
Counties are "medium" if share of employment in oil/coal at least 5% but less than 20%; "large" if share > 20%
All regressions control for **Change Since Last Election** in: log total population; percentage female adults; percentage Black adults, percentage "other" race; percentage population aged 30s, 40s, 50s, 60s, 70 and up
All regressions are weighted by number of adults.

Online Appendix Table 3. OLS Estimates of Effect of State Economic Area (SEA)-Level and Economic Sub-Region-Level Economic Performance on Voter Participation: Regressions for all SEAs and ESRs in U.S. for 1969-2000 Elections. First-Difference (Change Since Last Election) Models.

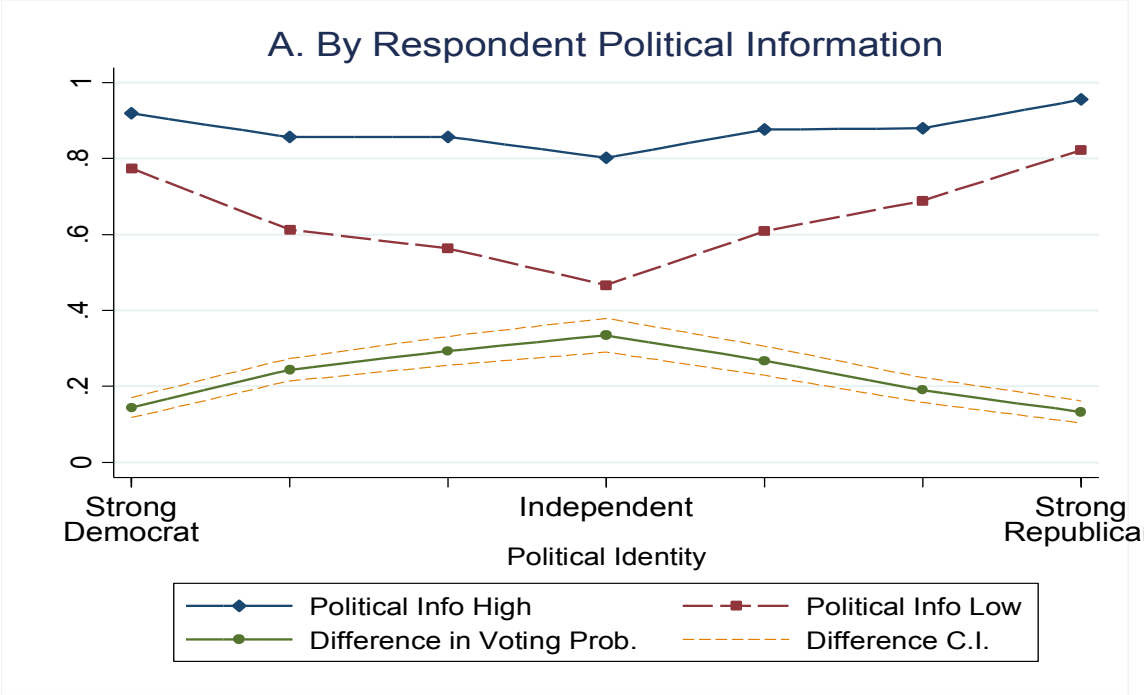
	Governor		Senate		President	
	SEA	ESR	SEA	ESR	SEA	ESR
(1) Log per capita Earnings	-.026	-.044	-.001	-.012	.002	-.001
	(.012)	(.013)	(.012)	(.014)	(.009)	(.010)
(2) Log Employment per adult	-.028	-.044	-.012	-.025	.009	.020
	(.018)	(.033)	(.023)	(.028)	(.014)	(.022)
Year Effects	No	No	No	No	No	No
State*Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3037	1568	3745	1935	3191	1666

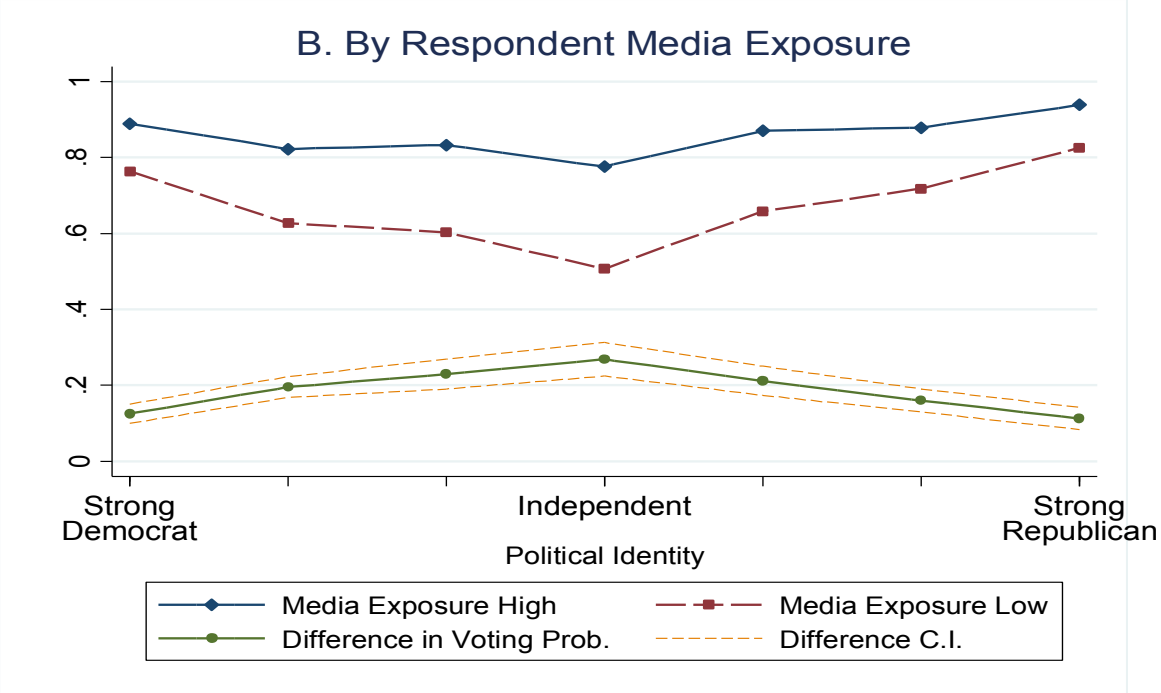
Each point estimate represents results from a different regression.
Standard errors account for arbitrary forms of clustering within states.
All regressions control for **Change Since Last Election** in: log total population; percentage female adults; percentage Black adults, percentage "other" race; percentage population aged 30s, 40s, 50s, 60s, 70 and up
All regressions are weighted by the number of adults.
SEA and ESR level variables are created by summing county observations within SEAs and ESRs.

Online Appendix Table 4. OLS Estimates of Whether Change in Share of County's Residents Living Outside County and Outside State Five Years Before, Differs across "Large", "Medium" and "Small" Production Counties in Oil and Coal States over Energy Shock "Boom" and "Bust".

	A. Δ County Residents who Living Outside *County* Five Years Prior		B. Δ County Residents who Living Outside *State* Five Years Prior	
	1970 to 1980	1980 to 1990	1970 to 1980	1980 to 1990
Importance of Oil/Coal in County:				
I(Medium_Coal_1974)	.010	-.022	.002	-.013
	(.005)	(.004)	(.004)	(.002)
I(Large_Coal_1974)	.002	-.024	.0001	-.016
	(.005)	(.004)	(.006)	(.004)
I(Medium_Oil_1974)	.022	-.021	.004	-.001
	(.004)	(.004)	(.006)	(.004)
I(Large_Oil_1974)	-.002	-.047	.003	-.017
	(.004)	(.005)	(.003)	(.007)
State Fixed Effects	Yes	Yes	Yes	Yes
F-Stat on Oil/Coal Shock (P-Value)	8.9 (0.001)	36.4 (<0.001)	0.9 (0.475)	18.7 (<0.001)
Observations	1103	1103	1103	1103

Each column in the table represents results from a different regression.
Standard errors account for arbitrary forms of clustering within states.
Counties are "medium" if share of employment in oil/coal at least 5 percent but less than 20 percent; "large" if share equals or exceeds 20 percent
1970-1980 regressions are weighted by the total population in 1980 age 5 and up.
1980-1990 regressions are weighted by the total population in 1990 age 5 and up.





Reported Voter Participation, by Alternative Measures of Individual Partisanship

Online Appendix Figure 1