The Political Economy of Vermont's Anti-Fracking Movement

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Abstract

In 2012, Vermont became the first state in the United States to ban hydraulic fracturing for natural gas and oil production despite having zero known reserves. We evaluate the role of legislators' and median voter's characteristics on Vermont general assembly's voting outcome on the bill H.464 (Act 152)−An act relating to hydraulic fracturing wells for natural gas and oil production. We find evidence that the campaign donations and being a Democrat positively affect the likelihood of a vote for this bill. Median voter characteristics appear not to play an essential role in shaping the voting behavior, corroborating the theory of expressive voting on the decision to ban fracking in Vermont.

Keywords: Anti-fracking, Vermont, median voter, special interests
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1 Introduction

The federal regulations are one of the primary determinants of the energy sector outputs in the United States (Hall and Shakya, 2019). However, the recent technological advancement on the horizontal drilling and the hydraulic fracturing (fracking) technologies has boosted the production of natural gas and oil from shale and other lower-permeability formations. As an effect, some Appalachian regions which were net importers of natural gas have become net exporters (Culver and Hong, 2016). The rise of fracking has led to an increase in calls to regulate or ban shale development due to possible negative externalities. A growing literature examines fracking regulations and bans from a political economy perspective (Rahm, 2011; Rabe and Borick, 2013; Boudet et al., 2014; Ritchie, 2014; Clarke et al., 2015, 2016; Hall et al., 2018). These studies look at locations that have known natural gas reserves and thus reflect both political and economic factors at play. In this paper, we look at Vermont general assembly's voting outcome on the H.464 (Act 152)−An act relating to hydraulic fracturing wells for natural gas and oil production. This bill later became an act made Vermont the first state in the United States to ban fracking. Note that Vermont state has no known natural gas and oil reserves, voting to ban fracking was mostly symbolic. Therefore, this event provides a unique opportunity to examine factors that drive the legislators' expressive voting.

It is interesting to understand the expressive voting considerations from economic considerations. From a narrow economic perspective, shale development positively impacts the economies of a region. Shale development reduces electricity bills as well as rent (Hausman and Kellogg, 2015), creates jobs (Maniloff and Mastromonaco, 2017), lowers natural gas prices (Scarcioffolo and Etienne, 2019), and impacts economic performance (Muehlenbachs et al., 2015). Additionally, shale development positively affects housing values, school funding, and decrease property tax rates (Weber et al., 2016). This evidence suggests that shale development enhances welfare. However, some regions/state rather preclude economics gains vis-a-vis the reduction of possible externalities related to the activity.

According to the literature, the main impacts of drilling unconventional oil and gas are twofold: environmental degradation and human health deterioration. From the former, there is a growing literature that measures the environmental impacts of the shale boom in the United States (Osborn et al., 2011; Vidic et al., 2013; Jenner and Lamadrid, 2013). There are three central environmental concerns of a typical fracking process: first, the injection of chemicals into the ground which can contaminate the ground-water aquifers; second, methane seeping into the water supply system; and third, the manifestation of radioactive materials as result of the fracking process (Jenner and Lamadrid, 2013).

In addition to the health impacts of consuming contaminated water and being exposed to radioactive materials, the fracking process might play a role in air pollution. Since most shale gas wells use diesel-powered pumps to inject water and depend heavily on trucks to deliver water to the site, there is evidence of higher levels of air pollution in regions with drilling activity. A study conducted in Pennsylvania shows that the number of hospitalizations for pneumonia among the elderly has increased in areas with fracking wells, indicating that the drilling process of gas and oil can contribute to air pollution, consequently affecting the well-being of the local population (Peng et al., 2018).

In response to possible environmental and health concerns, Vermont became the first state in the U.S. to ban fracking (Maur, 2015). On May 12, 2012, then Vermont Governor Peter Shumlin signed a bill that banned hydraulic fracturing wells from producing natural gas and oil. The ban is exclusively concerned with the environmental and public health impacts of fracking. However, if a new fracking technique is feasible and can produce without jeopardizing Vermont's environment, the Vermont legislatures have the power to revoke the moratorium on hydraulic fracturing (Department of Environmental Conservation, 2015). More interesting, however, is that the state of Vermont does not have commercial production of natural gas or oil or known reserves[1]. The state's only natural gas utility receives its inputs from a small-capacity pipeline from Canada (US Energy Information Administration, 2018). Unlike Vermont, southwestern New York locates at two of the shale gas basins in the United States − the Marcellus and Utica formation (Wegener, 2014). In 2010 some of New York's regions applied local zoning laws to ban fracking, followed by the state-level ban in December of 2014 (Podolny, 2013; Hall et al., 2018). New York's ban reflects the possible adverse effects of drilling natural gas and oil, i.e., environmental and health deterioration.

Since Vermont does not have proven shale reserves nor commercial production of fossil fuels, an interesting question arises. What were the main determinants in banning fracking activity in

[1]Existence of natural gas or oil resources in the state cannot be ruled out in Vermont (Department of Environmental Conservation, 2015).

a state that does not possess proven reserves of oil and natural gas? The vote seems to be purely expressive and not directly related to economic benefits or costs. The main contribution of this paper is that we isolate the ideological factors from political-economic factors that influence voting on fracking. In doing so, we follow Hall et al. (2018) approach to utilize the median voter model to understand the sources and strengths of the expressive voting regarding fracking.

Another contribution of this paper is that we utilize high dimensional feature data environment in a public choice context. Our approach conclaves the standard practice[2] but also deviates from conventional public choice scholars to illustrate the application of the double-selection post-LASSO approach in the data-rich environment. We believe that this approach is pertinent in this recent period as many jurisdictions are providing high-dimension data.

We examine two channels that could examine Vermont's fracking ban expressive voting. First is the channel of legislator's characteristics like birthplace, party affiliation, incumbent status, education, and political donations. Second is the median voters' characteristics like poverty rate, unemployment rate, income, and education. These channels are not randomized over voting, therefore explaining the relationship of these channels to voting outcome can be tenacious. If the common causes (confounders) between the channel and voting outcomes are appropriately conditioned, then the relationship between the channel and voting outcome is identified. Therefore, we utilize a high-dimension feature data to reduce chances of omitting relevant confounding variables. The double-selection post- LASSO method allows selecting the confounders and covariates from a high dimensional data to examine the impact of a particular channel of interest on the voting outcomes.

Our results suggest Democrats are likely to support the ban, while legislators that have received more contribution appears to have a higher likelihood to support the ban. On the median voter characteristics, legislators who represent districts with higher poverty rate are less likely to vote in favor of the ban, but this result fades in the robustness checks. In doing so, our results indicate a situation where voting appears to be purely expressive since some groups of voters thought to be in favor of fracking purely for economic reasons may be in favor of non-economic reasons. These findings contributes to the Expressive NIMBYism 'Not In My Back Yard" (Fischel, 2001) literature as well as to public choice, public finance and energy

[2]Standard literature use *a priori* theory to choose variable of interest (determinants) and include a small set of control in their reduced-form median voter models. Then, they would report the insensitivity of the estimates across different but small sets of controls.

policy literature.

We proceed as follows. Section 2 explores the state policy rationale for banning fracking. Section 3 describes the data. Section 4 presents our empirical results, and Section 5 concludes.

2 Policy rationale for banning fracking

Extensive literature focuses on understating the determinants of energy policy related to fracking and the economic benefits associated with fracking like jobs, revenues, and taxes. Another strand of literature examines the impacts of oil and natural gas production activities to the environmental, health (Rahm, 2011; Rabe and Borick, 2013), and social issues like crime (James and Smith, 2017; Shakya, 2019). Understanding these diverge literature assists policymakers to weigh between the economic benefits that fracking activity brings and potential negative externalities. Regions that have shale development perceive regulation as a mechanism to protect the environment from the possibility of negative externalities (Ritchie, 2014). However, what are the justifications for banning fracking in regions that do not produce oil nor natural gas? Possible explanations for why a state like Vermont banned fracking might be related but not limited to public perception, geographic distance, and expressive voting.

From the viewpoint of the public choice literature, the framing of the extraction of unconventional natural gas and oil can impact public perceptions. As shown in Clarke et al. (2015), regions where the terminology "fracking" is more relevant than "shale gas development" are more likely to support the ban since the term "fracking" has negative connotations. Moreover, Gottlieb et al. (2018) highlight the importance of the Narrative Policy Framework (NPF) in shaping public perception to influence policy outcomes. For example, the narrators in New York have consistently used narrative strategies to support their side, pro- and anti-hydraulic fracturing, regardless of whether they are winning or losing the policy debate. Mayer (2016) further highlight that public perception of risk and benefit of hydraulic fracking depends intensively on the individual trust in the oil and gas industry.

Ferrar et al. (2013) investigate the mental and physical health stressors perceived to result from Marcellus Shale development, and find that perceptions of health may be impacted by the activity, regardless of direct exposure or to psychosocial stressors. Further, Muehlenbachs et al. (2015) argue that the perception of nearby shale well plays an essential role in decreasing value of groundwater-dependent homes. For example, national mortgage lenders and insurance providers are refusing to provide services to houses within the proximity of nearby shale well. Therefore, literature validates that public view is pivotal to support or to oppose shale development regardless of the benefit and cost of the activity.

Geographic distance to areas under shale development might exert influence as well according to construal level theory (Clarke et al., 2016, 2015). Under construal level theory, areas geographically closer to shales gas development regions, i.e., southwestern Vermont, would be more likely to favor a ban on fracking since they can "experience" and "see" the impacts of the fracking activities on their neighbors (Clarke et al., 2016). Arnold and Holahan (2014) and Arnold and Neupane (2017) advocate that two neighboring regions might have different views toward hydraulic fracking not only because of "experience", but also because of government structure. Arnold and Holahan (2014) indicates that besides the state-level ban in New York, New York's Southern Tier possess more civic engagement towards fracking activities than the Pennsylvania border region due to the vital role of town halls in New York rather than the central decision making in Harrisburg. Further Arnold and Neupane (2017) show that poor southern tier municipalities with fewer democratic partisans in New York are more likely to support fracking.

Majority of the literature focuses on explaining the support or not of shale developing using public view approach and geographic distance. We exploit the Vermont General Assembly's voting on the H.464 (Act 152) to analyze expressive voting behavior. When voting on a single issue such as whether banning fracking activities in a region or not, the majority rule voting system will select the outcome most preferred by the median voter (Hall et al., 2018). This strategy broadens support for policy and the likelihood of the policy's adoption. Therefore, we can use the median voter model to analyze expressive voting in the case of banning fracking activities in Vermont.

3 Data

We web scrape the Vermont General Assembly's website to acquire the voting data of legislator on the H.464 (Act 152) bill and their respective districts. If the legislator voted "Yea," the variable VOTE assumes the value one and zero otherwise. From the total of 180 legislators in

Vermont, 150 belong to the House while the other 30 belong to the Senate. We have data of 167 legislator's vote who participated in the voting process.[3]

Since variables representing legislator, median voter, and the special interest factors could affect voting behavior (Congleton and Bennett, 1995), we have decided to examine two main mechanism effect. The first mechanism effect lies on the effect of legislator's characteristics such as birthplace, party affiliation, incumbent status, education, and political donations on voting behavior. We retrieve this data from the votesmart.org website. As investigated by O'Roark and Wood (2011), the academic background of politicians sometimes matters for voting. They find that members of Congress with undergraduate degrees in economics were less likely to vote for minimum wage legislation than members of Congress who graduated in economics.

If the legislator majored in the economics subjects in their higher education program, i.e., Bachelor of Arts (BA), Bachelor of Science (BS), Master or Ph.D. in economics, the variable ECONOMICS assumes the value of one and zero otherwise. Similarly, we consider another dummy variable to represent whether the legislator majored in any natural resource field in higher education programs or not, which the variable ENVIRONMENT takes the value of one when it is true. To account the possible effect of being born in Vermont, the variable BIRTHPLACE assumes the value one when the legislator was born in Vermont, zero otherwise. This dummy variable shed light on the intrinsic aspect of the local populations that are associated with a longer-term commitment to the state than non-locals. As presented in Hall and Shultz (2016), donation might influence voting behavior. Hence, we retrieved the total amount of donation that the legislator received (DONATION) from the followthemoney.org website. We also collect data on the incumbent status from the website, as mentioned earlier.

The second mechanism effect is related to the median voter characteristics of each district. Therefore, we assume variables like poverty rate, unemployment rate, income, and education to examine their effect on legislator's voting behavior. We collect the percent of families and people whose income in the past 12 months is below the poverty level (%POVERTY), percent of unemployment in civilian labor force (%UNRATE), log estimate income and benefits in 2010 inflation-adjusted dollars total households (HHINC), percent educational attainment graduate or professional degree (%GRADUATE). The H464 bill was voted in 2012. However, the leg-

[3] Six legislators filled vacancy positions during the 2010-2012 term. All those six legislators were elected in the 2012 election. Due to the lack of data from them in the 2010 election, we considered the 2012 election data instead.

islators were elected in 2010. Therefore, these variables for the lower chamber and the upper chamber district level are collected from the 2010, 5-year American Community Survey data profiles.

Other variables could be common causes confounders for poverty rate, unemployment rate, income, and education to explain voting outcomes. Therefore, to estimate whether these the median voter characteristic affects the electoral outcome or not, the common cause confounders should be adequately controlled. We retrieved social, economic, housing, and demographic data for lower chamber and upper chamber district level from 2010, 5-year American Community Survey data profiles[4]. In total, we have 80 potential variables as controls. Later in analysis, we include their square term and a set of full interaction which lead to additional 81 + 81 * 80/2 = 3240 variables.

4 Econometric model and results

We intend to estimate how legislator's observable characteristics and the median voter variables affect the voting outcome. At first, we study how the legislator's observable characteristics like their birthplace, party affiliation, incumbent status, education, and political donations affect the voting outcome. At second, we study how the median voter's characteristics like poverty rate, unemployment rate, income, and education affect the voting decision. However, several other variables are likely to confound with these the median voter's characteristics and the legislator's voting behavior.

For correct inference, adequately controlling the confounding and control variables is necessary. However, as a researcher, we do not observe exact data generating processes. Failure to adequately control can lead to endogeneity due to omitted variable bias. However, over-controlling leads to a loss of efficiency of estimates. A standard strategy is ad hoc to report the estimates implementing different sets of controls and show treatment effects from each channel are indifferent to changes in controls. This standard strategy lacks a principled method for proper variable selection.

[4] A list of potential confounders can be households type, relationship, marital status, fertility, grandparents, school enrollment, educational attainment, veteran status, residence one year ago, place of birth, language spoken at home, ancestry, employment status, commuting to work pattern, occupation, industry, class of worker, income and benefits, various poverty levels, housing occupancy, sex and age, race, mortgage status, gross rent as a percentage of household income, housing values, numbers of bedrooms, occupants per room, house heating fuel types. In the appendix, we provide a detailed list of these variables.

As said earlier, in total, we have 80 different potential variables as controls. Later in analysis, we include their square term and a set of full interaction which lead to additional 81 + 81 * 80/2 = 3240 variables. Note that we have only 167 instances of voting, so traditional ordinary least square methods are infeasible as the numbers of variables are more abundant than numbers of observations. Therefore, in this setting, we implement a double-selection post-LASSO methodology as suggested by Belloni et al. (2014a,b) to adequately select the confounder and covariate controls. The double-selection post-LASSO methodology utilizes the strengths and innovation of the least absolute shrinkage selection operator (LASSO[5]) − a predictive machine learning algorithm − and re-engineers it for causal inferences.

Belloni et al. (2014a) paper indicates that the double-selection post LASSO method comprises three steps. First, run LASSO of the voting outcome on the list of potential control variables to select a set of predictors for the voting outcome. Second, run LASSO of the variable of interests on the list of possible control variables to pick a set of predictors for the variable, of interest. In our study, the legislator's observable characteristics and the median voter's characteristics are variable of interest. The second step is essential, because exclusion of a covariate that is a modest predictor of the dependent variable, but a strong predictor of the channel variable can create a substantial omitted variable bias. In experimental data, the second step also serves as a test of randomization. If the channel variable is effectively randomized, no covariates should be selected in this step. Third, run ordinary least squares regression of outcome variable on the variable of interest, and the union of the sets of regressors chosen in the two LASSO runs. Then correct the inference with usual heteroscedasticity robust ordinary least squares standard error the estimates of the response of outcome variable on the interest variable yield a causal interpretation.[6]

[5]The Least Absolute Shrinkage and Selection Operator (LASSO) is an appealing method to estimate the sparse parameter from a high-dimensional linear model is introduce by Frank and Friedman (1993) and Tibshirani (1996). LASSO simultaneously performs model selection and coefficient estimation by minimizing the sum of squared residuals plus a penalty term. The penalty term penalizes the size of the model through the sum of absolute values of coefficients. Consider a following linear model $\tilde{y}_i = \Theta_i\beta_1 + \varepsilon_i$, where Θ is high-dimensional covariates, the LASSO estimator is defined as the solution to $\min_{\beta_1 \in R^p} E_n\left[(\tilde{y}_i -_i \Theta\beta_1)^2\right] + \frac{\lambda}{n}\|\beta_1\|_1$, the penalty level λ is a tuning parameter to regularize/controls the degree of penalization and to guard against overfitting. The cross-validation technique chooses the best λ in prediction models and $\|\beta\|_1 = \sum_{j=1}^{p} |\beta_j|$. The kinked nature of penalty function induces $\hat{\beta}$ to have many zeros; thus LASSO solution feasible for model selection.

[6]For the theoretical arguments see (Belloni et al., 2014b).

4.1 Model Estimation

First, we estimate the impacts of the legislator's observable characteristics on the bill H.464 (Act 152). We do so by estimating a unique regression for each of the legislator's observable characteristics; party affiliation, incumbent status, contributions to the campaign, birthplace, degree in Economics, and degree in Environmental studies. Table 2 presents the double-selection post-LASSO results for the legislator's observable characteristics mechanism effect and also for confounding variables.

From Table 2, column (1) sheds lights on the impact of party affiliation on the voting outcome. It appears that Democratic legislators are more likely to vote "Yea", and our results appear similar to Arnold and Neupane (2017). However, we point out a caution to interpret this effect. Scaling of the variable could lead to shrinkage of this coefficient but since we are more interested in the direction than the magnitude, party affiliation in fact present a significant effect on voting behavior. Since the Democratic Party proposed the Act, this result is not surprising. Additionally, being a Democrat is highly significant as a control variable for Columns (2) – (6).

The effect of incumbent status, shown in column (2), does not impact the likelihood of voting in favor of the ban. Column (3) shows that a higher amount of contribution is related to a higher likelihood to vote in "Yea", but presents a negligible effect. Contrary to our expectation, being a native legislator decreases the likelihood of voting in favor of the ban (column 4), and an education major is uncorrelated to the voting behavior (see column 5 and 6). We find the educated population which the legislator represents is a significant control variable. Legislators that represent districts that possess a larger population with at least Master degree are more likely to vote in favor of the ban. Additionally, we perform another set of double-selection post-LASSO on 80 + 80 + 80 * 79/ 2 = 3320 potential of control variables. We find a similar effect of the legislator's observable characteristics on the voting outcome. These results are in Appendix.

Considering the median voter variables (Table 3), we find evidence that the poverty rate and population with retirement income are statistically significant to explain voting behavior. Legislators that represent districts with higher poverty rate were more likely to vote "Nay" on the fracking ban (Column 1). Such a result is consistent with Arnold and Neupane (2017), in which districts that present more poverty rate might favor fracking as an opportunity to expand employment and the possibility of higher income. On the other hand, legislators that represent districts with a higher population with retirement income are more likely not to support the activity. Assuming retirement income is a proxy for the elderly population, this result might suggest that the elderly population perceive shale development as a net cost. Median income did not present a statistically significant effect in explaining the voting outcome. Party affiliation is positive and significant across all columns in Table 3 as a control variable, shedding light on the importance of political perception to vote against the activity. From column 4, large population working on the natural resource sector (NRCM) also appears to support the ban. However, when considering the cross interaction among variables and their squared values, the effect of the poverty rate and population with retirement income becomes insignificant.[7].

Our results might suggest that legislator's characteristic primarily drove the voting behavior. The "special interest" theory predicts that policy is the outcome of special interest groups and the constituent groups typically unintended consequences of any policy. Our result highlights expressive voting and possibly "special interest" on the fracking ban in a state with zero known natural gas reserves.

5 Conclusion

Vermont's General assembly voting on the anti-fracking bill is peculiar because Vermont has no known natural gas or oil reserves in the state. We exploit the Vermont anti–fracking bill to examine the nature of expressive voting. We examine the channel of legislator's characteristics and constituents median characteristics.

Our results indicate that being a Democrat affects voting for anti-fracking. In that respect, our results are not surprising and match the literature on fracking bans (Boudet et al., 2014; Davis, 2017). More closely linked to our study, Clarke et al. (2016) show that political ideology is weighted heavier the more geographically removed the population is from the fracking activity. Since Vermont does not have commercial production of natural gas nor oil, voting on fracking should reflect the expressive, not instrumental views, of voters. We find that donation contributions impact the voting outcome, but the effect is negligible. On the other hand, we find that the median voter characteristics are likely to be irrelevant to impact voting behavior

[7] Results available at Table 5 - Appendix A

on this particular bill.

Our results are naturally relevant for Vermont political economy. However, we would like to take caution to extrapolate our results to other regions. For example, states like Florida and Delaware do not have proper shale gas development plays. These regions are more concerned with the expansion of the activity even though they are not (and are unlikely to be) an active player in the fracking industry. Hence, legislators view about what is good or bad for the environment or health play a significant role on both sides of the debate. Future research could compare our results to Maryland, a state that banned fracking legislatively and has proven oil and natural gas reserves.

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Table 1: Descriptive Statistics

Variable	Min	Max	Mean	Std dev
Vote (% of "Yea")	0	1	0.78	0.42
Party (% of "Democrats")	0	1	0.67	0.47
Incumbent (%)	0	1	0.79	0.41
Log of $ Contribution	0	10.57	6.56	3.2
Birthplace (% born in Vermont)	0	1	0.31	0.46
Economics (% who study)	0	1	0.02	0.13
Environmental studies (% who study)	0	1	0.04	0.2
Population in poverty (%)	0	29.5	7.25	4.38
Unemployed population (%)	0	8.8	4.02	1.34
Population with retirement income (%)	5.3	26.6	16.65	3.67
Bachelors degree (%)	6.7	35.7	20.22	6.75
Some college but no degree (%)	11.5	26.9	16.81	2.23
Graduate or professional.degree (%)	4	42.2	13.2	6.3

n = 167

Table 2: Estimation result for Legislator's characteristics mechanism effect

	Dependent variable					
	Vote					
	(1)	(2)	(3)	(4)	(5)	(6)
Party	**0.521*****	0.545***	0.545***	0.504***	0.523***	0.521***
	(0.073)	(0.071)	(0.071)	(0.074)	(0.072)	(0.073)
Incumbent		**0.035**				
		(0.057)				
Contributions		0.00001***	**0.00001*****			
		(0.00000)	(0.00000)			
Birthplace				**−0.106***		
				(0.062)		
Economics				0.171	**0.204**	
				(0.123)	(0.125)	
Environmental studies	0.006			−0.015		**0.006**
	(0.028)			(0.029)		(0.028)
Graduate or professional degree (%)	0.009**	0.008**	0.007**	0.008**	0.009**	0.009**
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Constant	0.313***	0.234***	0.267***	0.366***	0.312***	0.313***
	(0.073)	(0.089)	(0.075)	(0.081)	(0.073)	(0.073)
Observations	167	167	167	167	167	167
R^2	0.423	0.452	0.451	0.440	0.427	0.423
Adjusted R^2	0.413	0.438	0.440	0.423	0.417	0.413
Residual Std. Error	0.319	0.312	0.312	0.316	0.318	0.319
Degrees of freedom	(df = 163)	(df = 162)	(df = 163)	(df = 161)	(df = 163)	(df = 163)
F Statistic	39.853***	33.347***	44.546***	25.343***	40.552***	39.853***
Degrees of freedom	(df = 3; 163)	(df = 4; 162)	(df = 3; 163)	(df = 5; 161)	(df = 3; 163)	(df = 3; 163)

Note: ***, **, * represents significant in 10%, 5% and 1% level of significance. Enclosed values in (.) are heteroscedasticity consistent robust standard errors. The estimates of interest are highlighted bold for each model presented from column (1) to (6) while covariates are selected using the double-selection post-LASSO method.

Table 3: Estimation result for median voter characteristics mechanism effect

	Dependent variable					
	vote					
	(1)	(2)	(3)	(4)	(5)	(6)
Population in poverty (%)	**−0.018***					
	(0.010)					
Unemployed population (%)		**−0.0003**				
		(0.020)				
Population with retirement income (%)			**0.022****			
			(0.011)			
Bachelor's degree (%)				**0.018**		
				(0.014)		
Some college but no degree (%)				−0.006	**−0.010**	
				(0.013)	(0.013)	
Graduate or professional.degree (%)	0.009**	0.012	0.016***	0.014	0.010**	**0.006**
	(0.004)	(0.009)	(0.005)	(0.009)	(0.004)	(0.010)
Population with SNAP (%)	0.006			0.015*		
	(0.007)			(0.008)		
NRCM occupations (%)			0.015	0.031***		
			(0.012)	(0.009)		
Party	0.517***	0.528***	0.524***	0.517***	0.515***	0.529***
	(0.073)	(0.073)	(0.070)	(0.073)	(0.073)	(0.071)
Constant	2.052	−1.051	−0.431	−2.004	0.712	1.744
	(1.871)	(1.792)	(0.806)	(2.508)	(0.470)	(2.221)
Observations	167	167	167	167	167	167
R^2	0.438	0.433	0.477	0.477	0.429	0.471
Adjusted R^2	0.421	0.408	0.450	0.432	0.407	0.430
Residual Std. Error	0.317	0.321	0.309	0.314	0.321	0.314
DF	(df = 161)	(df = 159)	(df = 158)	(df = 153)	(df = 160)	(df = 154)
F Statistic	25.135***	17.333***	17.988***	10.717***	20.000***	11.444***
DF	(df = 5; 161)	(df = 7; 159)	(df = 8; 158)	(df = 13; 153)	(df = 6; 160)	(df = 12; 154)

Note: ***, **, * represents significant in 10%, 5% and 1% level of significance. Enclosed values in (.) are heteroscedasticity consistent robust standard errors.

Appendix A

Table 4: Estimation result for Legislator's characteristics mechanism effect considering cross interaction and lagged variable

	Dependent variable					
	vote					
	(1)	(2)	(3)	(4)	(5)	(6)
Party	0.511***					
	(0.077)					
Incumbent		−0.005				
		(0.056)				
Contributions			0.00001**			
			(0.00000)			
Birthplace				−0.109*		
				(0.061)		
Economics					0.173*	
					(0.097)	
Environmental studies						−0.022
						(0.030)
Observations	167	167	167	167	167	167
R^2	0.445	0.480	0.499	0.494	0.483	0.480
Adjusted R^2	0.413	0.443	0.464	0.451	0.446	0.443
Residual Std. Error	0.319	0.311	0.305	0.309	0.310	0.311
Observations	(df = 157)	(df = 155)	(df = 155)	(df = 153)	(df = 155)	(df = 155)
F Statistic	13.998***	13.001***	14.054***	11.475***	13.158***	13.005***
Observations	(df = 9; 157)	(df = 11; 155)	(df = 11; 155)	(df = 13; 153)	(df = 11; 155)	(df = 11; 155)

Note: ***, **, * represents significant in 10%, 5% and 1% level of significance. Enclosed values in (.) are heteroscedasticity consistent robust standard errors.

Table 5: Estimation result for median voter characteristics mechanism effect cross interaction and lagged variable

	Dependent variable					
	vote					
	(1)	(2)	(3)	(4)	(5)	(6)
Population in poverty (%)	−0.015					
	(0.012)					
Unemployed population (%)		−0.009				
		(0.023)				
Population with retirement income (%)			0.011			
			(0.013)			
Bachelors degree (%)				0.015		
				(0.016)		
Some college but no degree (%)					−0.017	
					(0.014)	
Graduate or professional.degree (%)						0.024**
						(0.011)
Observations	167	167	167	167	167	167
R^2	0.507	0.503	0.501	0.573	0.486	0.553
Adjusted R^2	0.444	0.443	0.429	0.467	0.446	0.458
Residual Std. Error	0.311	0.311	0.315	0.304	0.310	0.307
Observations	(df = 147)	(df = 148)	(df = 145)	(df = 133)	(df = 154)	(df = 137)
F Statistic	7.971***	8.330***	6.939***	5.400***	12.122***	5.833***
Observations	(df = 19; 147)	(df = 18; 148)	(df = 21; 145)	(df = 33; 133)	(df = 12; 154)	(df = 29; 137)
Note:						*p<0.1; **p<0.05; ***p<0.01

Note: ***, **, * represents significant in 10%, 5% and 1% level of significance. Enclosed values in (.) are heteroscedasticity consistent robust standard errors.