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The Economics and Politics of Carbon Taxes and Regulations: Evidence from Voting on Washington State's Initiative 732

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Abstract: In November 2016, Washington State voters were presented with a ballot initiative (Initiative 732) advancing the first carbon tax on production and use of fossil fuels in the United States. Initiative 732 promised to reduce fossil fuel consumption by taxing carbon emissions, while remaining revenue-neutral by lowering taxes on businesses, consumers, and working families. In promising revenue-neutrality, Initiative 732 sought support beyond environmentalists and similarly sympathetic voters. It failed to pass, achieving 41.2 percent of votes cast. To investigate this initiative's failure at the ballot, we analyzed zip code-level voting patterns and demographic data. Relying on a two-step LASSO (Least Absolute Shrinkage and Selection Operator) + OLS (Ordinary Least Squares) procedure, our results suggest that the framing of revenue-neutrality did not sufficiently satisfy moderate right-leaning voters regarding perceived costs of the carbon tax. We also found evidence suggesting not only that some voting segments may have opposed revenue-neutrality, but that those facing higher climate change risk did not appear to see the initiative's value net of expected costs.

Keywords: carbon tax; ballot initiative; voting results; income transfer; business tax; revenue neutral

JEL Classification: D72; H73; H71; Q38

> Washington State's coming vote on carbon taxes exemplifies the power of people to attack climate change meaningfully. It started with the efforts of one person, Yoram Bauman, who led the charge. Then, more than 300,000 people signed a petition to put the issue on the ballot. And now, the 4.2 million registered voters of Washington State will have a chance to register their position by checking yes or no on Nov. 8. That's climate action, and leadership [1].

1. Introduction

In 2016, Washington State voters rejected a carbon tax initiative, and it is not clear why. Democratic candidate Hillary Clinton won the state's 12 electoral votes with 55.7 percent of ballots cast, over Republican Donald Trump's 38.1 percent, according to the Washington Secretary of State [2]. That presidential race result met expectations: Democrats tend to dominate statewide races in Washington. Partisan trends in the state might have led the casual observer to expect passage of Initiative 732—a revenue-neutral state carbon tax promising to combat climate change—but Washington voters rejected the initiative by 58.9 percent, according to the Washington Secretary of State [3].

In assessing this apparent misalignment, we considered the literature that helps us differentiate between public interest, private interest, and ideology theories of regulation (including Pigouvian taxes as *regulatory* instruments) as they might apply to direct democracy. In turn, we analyzed available data on socioeconomic groups to see how preferences revealed by secret ballot might be explained by one or more theories of regulation. We explored which demographic, housing, transportation use, employment, industrial, or other socioeconomic factors might explain reluctance among Washington voters to accept the revenue-neutral carbon tax posed by 732.

Initiative 732's fate as the first carbon tax ballot measure in the United States [4], and our postmortem, shed light on which variables might otherwise get overlooked in crafting and framing future carbon tax ballot measures. We found that Washington voters were apparently more likely to favor 732 if they: (a) were employed in the military, in professional, scientific, management, or administrative services, or in waste management; (b) used non-public transportation that does not include driving alone, carpooling, or walking; and (c) used public transportation. We found that Washington voters tended to oppose 732 if they: (a) were white; (b) lived in zip codes with higher rates of housing occupancy; (c) had longer commute times; and (d) worked in sales, offices, agriculture, fishing, natural resource extraction, transportation, warehousing, utilities, or government.

To make sense of these associations, we first present some background on Initiative 732. We follow with a discussion of the expected economic and social impacts of Initiative 732 and how these might relate to voting. We then present a brief description of the LASSO technique used for variable selection and arriving at our preferred regression specification. Lastly, we interpret significant OLS results, discuss their implications, and conclude with a view of follow-up research, and perhaps future carbon tax referenda.

2. Initiative 732

Initiative 732, presented to Washington voters in the 2016 election cycle, was intended "to encourage sustainable economic growth with a phased-in one percentage point reduction of the state sales tax, a reduction of the business and occupation tax on manufacturing, and the implementation and enhancement of the existing working families' sales tax exemption for qualifying low-income persons, all funded by a phased-in carbon pollution tax on fossil fuels sold or used in this state and on the consumption or generation in this state of electricity generated by the consumption of fossil fuels" [5].

This initiative was the first in the United States to propose a three-stage phasing in of a carbon tax on fossil fuels sold or used, and on the consumption or generation of electricity generated with fossil fuels. Phase I was to begin 1 July 2017, with a rate of \$15 per tonne carbon dioxide (CO_2); Phase II on 1 July 2018, with a rate of \$25 per tonne CO_2; and Phase III on 1 July 2019, with a rate increase of 3.5 percent plus an adjustment based on the federal Consumer Price Index. (Tonne is a metric ton: 1 tonne = 1000 kg $\approx$ 2204.6 lbs.) Rates would have been capped at \$100 per tonne CO_2 in 2016 dollars. The initiative was intended to be revenue-neutral by making three changes in tax collection and government spending. First, a one percent reduction in the general state sales tax would have been phased in on a schedule similar to the implementation of the carbon tax. Second, the business and occupation tax for the manufacturing sector would have been reduced to nearly zero. Third, the working poor would have received an enhancement to the working families sales tax exemption (by a 25 percent match of the federal Earned Income Tax Credit) to mitigate anticipated higher costs of consuming electricity and gasoline.

Voters were ultimately presented with the following language, vetted by several surveys, including testing the initiative's working language against a hypothetical and generic climate policy involving the possibility of "stronger limitations" or "new taxes" [6]:

> Initiative Measure No. 732 concerns taxes.
>
> This measure would impose a carbon emission tax on certain fossil fuels and fossil-fuel-generated electricity, reduce the sales tax by one percentage point and increase a low-income exemption, and reduce certain manufacturing taxes.

3. Expected Economic Impact and Political Environment

Initiative 732's proposed reduction in the state sales tax was calculated to mitigate the negative financial effects of the carbon tax and reduce disincentives to vote against it because of distributional concerns [7]. In addition, the initiative offered the working poor an enhancement to the sales tax exemption, mitigating the carbon tax's effect on electricity and gasoline prices, which were expected to rise under the tax. Sales taxes are considered regressive because they take a greater proportion of discretionary income from the poor than from those with higher incomes. Institute on Taxation and Economic Policy [8] (p. 12) stated that "sales and excise taxes are the most regressive element in most state and local tax systems." Most measures of regressivity or progressivity are done as snapshots. However, even when looking in a lifetime sense, sales taxes tend to be regressive [9]. By some estimates, Washington State had one of the most regressive tax codes in the country prior to the vote, and 732 would have significantly cut the average tax rate for married families with two children whose annual household income was under $21,000 [10].

The initiative also promised to virtually eliminate the state business and occupation tax for the manufacturing sector. This component was added because, similar to households, the manufacturing sector would have faced higher electricity and transportation fuel costs. There was concern among carbon tax opponents that, without the elimination of the business and occupation tax, manufacturers would leave the state to avoid the burden of the tax [10]. In fact, several business-advocacy groups campaigned against the initiative [7]. At the same time, however, CarbonWA raised nearly four times the funds that the opposition did [10].

In the concurrent presidential election, Washington voters approximately mirrored country-wide population-density patterns: dense urban centers tended to vote Democrat, and the sparser remainder—often rural—tended to vote Republican [11]. For an analysis of one particular Washington county, see Dake [12]. Cambden [13] detailed how Democrats lost many precincts from the previous Presidential election. Public opinion on energy-environmental policy such as carbon taxes tends to fall along conventional partisan splits, with pro-green or anti-industry interests aligning approximately with Democrat or progressive touchstones, and pro-growth, pro-fossil fuel, or pro-business interests lining up with Republican demographics. For example, a post-2016 election poll in Washington State shows that voters in counties that went for Trump were "much more likely to say environmental regulations hurt the economy..." ([14], p. 3.) This pattern is mirrored in the empirical literature on environmental and energy regulation that leverages state-level legislator data on the League of Conservation Voters [15] and the Sierra Club [16], and also is reflected in Grainger's (2010) [17] work relating environmental ideology with partisan redistricting behavior (similarly by way of scoring legislators according to the preferences of the California League of Conservation Voters).

Initiative 732 was presumed to align approximately with partisan distributions, despite some apparent early defection away from the pro-initiative coalition. Groups responsible for placing the initiative on the November 2016 ballot framed the proposal as budget-neutral [18]. However, analysis from Washington State projected a small budget deficit over the first six years of implementation [19], likely frustrating the budget-neutrality promise. Some politicians used this anticipated deficit in a fight to thwart 732, including leaders of the Washington State Democratic Party [20]. Social welfare advocacy groups argued that 732 did not go far enough in raising revenue for redistribution to the poor, resulting in a net negative for their constituents [21]. Another set of special interest groups representing "green energy" wanted 732 to raise additional revenue, so that additional funds could be used to subsidize wind, solar, and other green energy initiatives [22].

Unlike the splintered pro-732 coalition, opposition groups aligned as a concurring coalition, from business to fossil energy, agriculture, and conservative groups [23]. That difference in cohesion on either side—between unity in opposition and fragmented support—helps *in part* to explain Initiative 732's failure.

Given that this fissure did not map cleanly to ordinary partisan divides, we set party affiliation aside as a reliable explanation for the ballot initiative's failure. We recognize that ideological preferences within voter segments tend to treat core issues more like complements, rather than substitutes. Issue-satisfaction might vary markedly across segments (as discrete jumps), and satisfaction in one issue for one segment could come at the expense of other issues or segments. Budget neutrality may not be enough of a fiscal selling point for those right of center (e.g., Washington carries above-average state debt), who may worry about increased costs and prices of living and production, while those left of center may feel that the expected environmental benefits of such a carbon tax may not be worth the short-run limitations of budget neutrality on redistributive social policy. At its simplest, the voter preferences described here suggest that the weakest reason to vote for a given initiative—across more than one voter segment—dominates in a concurrence of dissatisfaction.

To better mark the contours of sub-partisan preferences as potential determinants (or close complements of those determinants), we focus on social and economic factors, such as employment, income, government benefits, and other similar items, as potential explanatory variables, in turn motivating the LASSO model selection technique [24]. The purpose of this model selection stage is to gain insight into potentially hidden predictors of 732's failure that might be associated with demographics and economic characteristics, rather than political ideologies or stated issue preferences.

4. Empirical Approach and Data

4.1. Overview and Data

There is a rich body of literature assessing voter preferences and their possible trade-offs against aggregate voting outcomes. In education, for example, there are several papers using aggregate voting outcomes to try to understand the role that the age distribution of the voting populace has on support for public education [25–27]. While polls are useful—as expressions of *stated preference*—they are distinct from the *revealed preference* process of secret-ballot voting. Polls may not reveal how social, economic, or demographic factors were useful in predicting the eventual outcome. (Two of the better post-election survey papers are those of Fischel [28] and Thalmann [29]).

Given that environmental quality has "public good" characteristics, environmental scholars have considered voting patterns to better understand consumer demands for environmental goods [30–33]. For example, in an important early work, Kahn and Matsusaka [30] used voting behavior on 16 environmental ballot provisions in California to find that voters tend to find reduced income in construction, farming, forestry, and manufacturing to be the price of more environmental goods.

We followed these papers by employing a median voter model where, because of the first-past-the-post nature of referendums and initiatives, the voter in the middle of the voting population is considered to be decisive [34]. Holcombe [34] highlighted the distinction between the strong and weak versions of the median voter theorem. The strong version states that the median voter is decisive. The weak version states that the median voter is a good approximation for what determines outcomes, because the preferences of the median voter determine the extent to which voters can deviate. For example, Brunner and Ross [26] showed that the median voter is not always decisive in school spending. However, the extent of this deviation depends on the median in a particular geography. Unlike these papers, however, we do not begin with a pre-selected number of explanatory variables. Theory and previous literature suggest that the structure of the policy's expected financial benefits tends to influence who supports implementation of the carbon policy [35,36]. While the median voter model and basic economic theory suggest factors that may influence voter demands for carbon taxes, theory does not help us in the ranking of empirical proxies [37]. In the past, explanatory variables across geographic areas were limited, and stronger priors helped, especially for years that did not coincide with the decennial census. Today, however, census data of greater dimension are available at nearly all geographic levels through the American Community Survey (ACS). In any case, we applied the median-voter model to voter segments, however many segments may be empirically identified by segment attributes.

For example, for zip codes in Washington State, there are hundreds of variables in the ACS. Even after eliminating variables with zero theoretical link to demands for or against carbon taxes, we have 50 explanatory variables that might be related to voting on Initiative 732 (Table A1). We reduced this vector of variables using LASSO for factor sorting. LASSO regression penalizes absolute values of coefficient magnitudes in order to discover more parsimonious regression models (eliminates coefficients and reduces multicollinearity). From the broad set of potential predictors in Table A1, we used LASSO to sort out those that may be both weaker and statistically redundant. For example, the fact that studies have shown that environmental quality is a normal good for most voters [30] suggests that household income is likely to be important. However, is it the mean household income or median household income that is more salient? Using zip code-level voting data on Initiative 732 from Washington Secretary of State [3] and zip code-level explanatory variables from the 2011–2015 American Community Survey 5-Year Estimates, we used LASSO to help determine which factors are most correlated with voting outcomes before moving onto our regression analysis using Ordinary Least Squares (OLS).

To enhance identification and check robustness on our LASSO-delimited variable coefficients, we admitted two additional variables that stand to further condition our model for public interest related to carbon intensity and climate risk. Specifically, carbon intensity was provided in association with the study by Jones and Kammen [38] on the role of suburbanization in undermining greenhouse benefits of urban population density. Climate risk was reflected by way of estimated economic damage, as percentage of county income, using data from Hsiang et al. [39].

4.2. Variable Section Using LASSO

The first LASSO stage narrows the scope variables by statistical relevance, increasing parsimony and efficiency (smaller standard errors) of resulting regression parameter estimates. LASSO helped avoid Type II error by de-emphasizing variables that weaken prediction of 732 adoption (narrowed standard errors), serving the objective of this study: to better describe electorate characteristics that might have cut against passage, rather than infer causality. The resulting set of variables also helped avoid Type I errors (omitted variable bias) in our OLS regression model on zip-level voter approval rates.

The LASSO approach used here leverages work by Hastie and Qian [40], similarly followed by Scarcioffolo et al. [41], in their analysis of a fracking ban bill passed by the Vermont House of Representatives. The objective function for the penalized logistic regression used here also employs a negative binomial log-likelihood of the following form:

$$\min_{(\beta_0,\beta)\in\mathbb{R}^{p+1}} -\left[\frac{1}{N}\sum_{i=1}^{N} y_i\cdot(\beta_0+x_i'\beta)-\log\left(1+e^{(\beta_0+x_i'\beta)}\right)\right]+\lambda\left[\frac{(1-\alpha)\|\beta\|_2^2}{2}+\alpha\|\beta\|_1\right] \tag{1}$$

where λ is a tuning parameter, and α is an elastic-net mixing parameter, with dataset (x, y) and coefficient choice vector β otherwise in their usual places.

After LASSO was applied to all ACS variables listed in Table A1, the variables listed in Table 1 formed our predictor set on ACS characteristics, plus index variables measuring carbon intensity and climate risk.

This set can be separated into three vectors. Let X represent a vector of demographic or socioeconomic variables selected, Z a vector of employment variables, and W a vector of environmental values (carbon intensity and climate risk). That demarcation of sifted variables translates into the following linear specification:

$$Y = \alpha + X\beta + Z\gamma + W\phi + \varepsilon \tag{2}$$

Erring on the side of caution, we assert two-tailed null hypotheses throughout, in which $\beta = 0$, $\gamma = 0$, and $\phi = 0$. Various socioeconomic and employment variables might be presumed to run against approving Initiative 732—including a provision for revenue neutrality (reducing some taxes)—but agnosticism on each parameter allowed us to entertain any surprises that might emerge.

Table 1. Variables used in OLS models.

Name	Description
% Yes	% of "yes" votes on Initiative 732.
% White	% of individuals identifying as white.
% Housing Occupied	% of housing units in the area that were occupied.
% Armed Forces	% of individuals in the labor force in Armed Forces.
% Public Transit	% of workers 16 and older who commute by public transit.
% Other Transit	% of workers 16 and older who commute by other means.
Mean Commute	Mean travel time to work in minutes.
% Sales and Office	% workers in sales and office occupations.
% Agriculture	% employed in agriculture, forestry, fishing and hunting, and mining.
% Manufacturing	% employed in manufacturing.
% Transportation	% employed in transportation, logistics, warehousing, and utilities.
% Finance	% employed in finance and insurance, real estate, and rental and leasing.
% Professional/Waste	% employed in professional, scientific, management, admin., and waste management.
% Arts and Hospitality	% employed in arts, entertainment, recreation, accommodation, and food services.
% Government	% employed in government.
Household Income	Mean household income in 2015 inflation-adjusted dollars in thousands.
% Families w. Inc. Ben.	% of families with income and benefits.
% Health Insur. <18	% of population under 18 with health insurance coverage.
Carbon Intensity	Household Carbon Footprint (HCF) index data.
Climate Risk	Estimated long-term economic damage from climate change as a % of county income.

Note: % Yes was obtained from Washington Secretary of State [3]. All but the last two variables obtained from the American Community Service from the 2011–2015 American Community Survey 5-Year Estimates. Carbon Intensity and Climate Risk obtained from Hsiang et al. [39]. All employment variables refer to the civilian-employed population 16 years and over.

4.3. Factor Correlation

Table 2 indicates how our LASSO-selected predictors correlate with our dependent variable, zip code-level approval of Initiative 732. These mere correlations suggest that, without holding anything else constant, approval of 732 was best correlated with use of public transportation, median household income, and employment in a pool of science, professional services, administration, and waste-management lines of work, followed by financial industries (including real estate and insurance). Disapproval of 732—again, not controlling for other variables—seems to be most correlated with being white, higher rates of minors with health insurance (under 18) in that zip code, and employment in a pool of agriculture, fishing, forestry, and other resource extraction.

Table 2. Correlation between 732 Yes vote by zip code vs. variables delimited via LASSO for use in OLS.

Name	Correlation	Name	Correlation
% White	−0.37578	% Transportation	−0.26657
% Housing Occupied	0.08666	% Finance	0.30801
% Armed Forces	0.12789	% Professional/Waste	0.52958
% Public Transit	0.70965	% Art and Hospitality	0.24168
% Other Transit	0.24462	% Government	−0.21082
Mean Commute	−0.02926	Household Income	0.34530
% Sales and Office	0.00272	% Families w. Inc. Ben.	−0.10989
% Agriculture	−0.39871	% Health Insur. <18	−0.35194
% Manufacturing	0.04501		

5. Preferred Specification: OLS Results

We tested the resulting 17 ACS variables as core explanatory variables across four OLS regressions explaining zip code-level voting on Initiative 732: the ACS set alone, controlling further for estimated carbon intensity, then climate risk, and finally for both of these additional variables together (see Table 3). From the resulting OLS specification on this narrowed set of socioeconomic and employment variables, we see that Washington voters were more likely to favor 732 if they: (a) were employed in the military (except when controlling for climate risk alone), in professional, scientific, management, or administrative services, or in waste management; (b) used other means of commuting that did not include driving, carpooling, public transit, or walking (such as bicycling); and (c) used public transportation. However, Washington voters tended to oppose 732 if they: (a) were white; (b) lived in areas with higher housing occupancy rates; (c) commuted longer to work; and (d) worked in sales, offices, agriculture, fishing, natural resource extraction, transportation, warehousing, utilities, or, perhaps to the surprise of some, government.

Table 3. Correlation between 732 Yes vote by zip code vs. variables delimited via LASSO for use in OLS.

Model:	(1)		(2)		(3)		(4)	
% White	−0.264 ***	(0.021)	−0.222 ***	(0.021)	−0.026 ***	(0.020)	−0.225 ***	(0.021)
% Housing Occupied	−0.117 ***	(0.027)	−0.061 **	(0.028)	−0.104 ***	(0.027)	−0.054 *	(0.028)
% Armed Forces	0.221 ***	(0.062)	0.200 ***	(0.061)	−0.216 ***	(0.062)	0.198 ***	(0.060)
% Public Transit	0.774 ***	(0.068)	0.629 ***	(0.071)	0.783 ***	(0.068)	0.645 ***	(0.071)
% Other Transit	0.549 ***	(0.105)	0.460 ***	(0.103)	0.549 ***	(0.104)	0.466 ***	(0.102)
Mean Commute	−0.146 ***	(0.037)	−0.070 *	(0.039)	−0.159 ***	(0.037)	−0.085 **	(0.039)
% Sales and Office	−0.187 ***	(0.055)	−0.207 ***	(0.054)	−0.187 ***	(0.055)	−0.206 ***	(0.053)
% Agriculture	−0.353 ***	(0.039)	−0.331 ***	(0.0379)	−0.329 ***	(0.039)	−0.312 ***	(0.038)
% Manufacturing	0.038	(0.060)	0.048	(0.058)	0.028	(0.060)	0.039	(0.058)
% Transportation	−0.327 ***	(0.077)	−0.305 ***	(0.075)	−0.309 ***	(0.077)	−0.292 ***	(0.075)
% Finance	0.101	(0.089)	0.162 *	(0.087)	0.0833	(0.088)	0.144 *	(0.087)
% Professional/Waste	0.073	(0.067)	0.061	(0.065)	0.071	(0.066)	0.060	(0.065)
% Art and Hospitality	0.045	(0.057)	0.040	(0.055)	0.047	(0.056)	0.042	(0.055)
% Government	−0.167 ***	(0.031)	−0.144 ***	(0.030)	−0.182 ***	(0.031)	−0.157 ***	(0.031)
Household Income	−0.142 ***	(0.033)	0.0001	(0.041)	−0.139 ***	(0.032)	−0.007	(0.041)
% Families w. Inc. Ben.	0.422 ***	(0.081)	0.197 **	(0.089)	0.423 ***	(0.080)	0.213 **	(0.088)
% Health Insur. <18	−0.120 ***	(0.035)	−0.136 ***	(0.034)	−0.141 ***	(0.035)	−0.152 ***	(0.035)
Carbon Intensity			−0.384 ***	(0.069)			−0.359 ***	(0.069)
Climate Risk					−0.640 ***	(0.194)	−0.504 ***	(0.191)
R^2	0.759		0.774		0.764		0.776	
F-Statistic	92.2		94.2		89.5		90.7	
p-value	<0.001		<0.001		<0.001		<0.001	

Intercept included in regression but not reported. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors in parentheses. The unit of analysis is the zip code and we have n = 491.

It makes sense that the apparent negative (and significant) effect of household income on 732's approval disappears when controlling for carbon intensity (Models 2 and 4): we can expect carbon intensity to be correlated with household income in the same area. However, the positive propensity of families with income and benefits (vs. those without either) to approve 732 was nearly halved when controlling for carbon intensity.

Results across regressions involving the two additional environmental variables appear robust: negative, significant, and running at similar magnitudes. This suggests both that areas where people tend to rely on carbon-intensive inputs and those who face higher climate change risks tended to disapprove of 732. That last result is interesting because, at face value, we might expect that result to be positive. This tends to suggest—having controlled for the other factors in both Models 3 and 4—that voters did not generally interpret 732's language as climate risk-reducing. How could that happen? If voter preferences tended to require such a referendum to clear some hurdle for them to agree to incur the initiative's costs, even controlling for the other factors considered, they may have seen it as net-present cost in expectation. It is interesting that in Model 3, where ACS variables are controlled further only by climate risk, members of the military appear to significantly disfavor 732 by the same magnitude at which they significantly favor it in all other models. This supports that perceptions on both carbon intensity and climate risk matter for better identification of ACS variable coefficients, suggesting we should prefer Model 4 in analyzing similar referenda in the future.

The revenue-neutrality feature did not appear to impress those in regular middle-class occupations, and perhaps it should not be a surprise that those regularly using public transportation would have a favorable opinion of the carbon tax initiative, revenue-neutral or not. However, we are interested in learning more about Initiative 732's failure in terms of socioeconomic and employment segments. We note that significant approval segment effects may at least tell us who the initiative tended not to lose.

However, who did they *tend to lose*? Our results suggest that proponents of 732 tended to lose whites, those living in areas with high housing occupancy rates, office workers (including salespeople), plus those in resource extraction and industrial employment. We also see that *government* workers tended to oppose 732, a segment which might overwhelmingly skew Democrat and were disinterested in or turned off by revenue neutrality. For government workers, who could be assumed to have an implicit interest in larger government budgets for purposes of career growth and job security [42], Initiative 732 may have been seen as a threat to revenue stability, if not posing a risk of being revenue-negative, despite political promises of a revenue-neutral baseline.

Where government workers may have been neglected on assurances against a revenue downside, commuters may have tended to reject the measure (in a state where automobile commuting is ubiquitous) if they thought that the incidence of the carbon tax on them would outweigh the complementary tax-reducing provisions of the initiative.

6. Conclusions

Initiative 732 seems to have faced a problem of balancing the way it promised to change tax incidence for voters, even as nominally revenue-neutral. Government workers likely saw downside risk in the design for (stated) revenue-neutrality alone, or they may have lamented that it did not promise to *grow* budgets as they might expect most taxes to do. Longer-haul commuters most likely saw the initiative as a net tax—net of sales tax reduction and other benefits in the policy bundle. With the remainder of employment, demographic, and socioeconomic variables tested together, we did not find surprises. Workers in extractive or manufacturing industries, for example, can normally be expected to reflect many of the private interests of those industries, and therefore likely bristle at the prospect of a carbon tax, billed as carbon-neutral or not.

Although our results suggest that carbon intensity tended to incline voters against 732, as we expected, we found that voters were not likely convinced of 732's capacity to reduce climate risk, suggesting that it may have been denied for failure to generally clear perceived cost–benefit thresholds. Further, the relatively smaller constituency of government workers may not dominate, but they seem not to be a trivial constituency for purposes of making revenue neutrality—or at least revenue non-negativity—believable (in the same way that teachers and government school administrators are often active or instrumental in debates over education-funding taxes and bond issues).

Our findings contribute to the literature on the political economy of carbon taxes. Lucas Jr [43] offered psychological reasons carbon taxes are unappealing to voters. In particular, his analysis highlights how voters are biased towards proposal designs that make the tax less efficient, such as having to set a tax rate that is well below estimates of the social cost of carbon. (For this reason, Carattini et al. [44] suggested that carbon taxes be phased in over time.) Lucas Jr [45] highlighted how voters have behavioral biases towards less efficient environmental regulations and what this means for carbon taxation. He argued that conservatives should agree to a revenue-neutral carbon tax if efforts can be made to partner with environmentalists to reduce more costly and less effective environmental regulations.

Our results from the state of Washington suggest that it may be very difficult to pass a revenue-neutral carbon tax at the state level, as voters seem to be engaged in a multiple period game, holding out for some other policy that seems more palatable to their specific circumstances.

Voters in areas with longer commute times, for example, clearly did not feel that the benefits of Initiative 732 outweighed the costs to them. While this could necessitate a reshuffling of costs and benefits in order to reach the median voter, policymakers should be open to the possibility that the imprecise nature of redistributive politics, when combined with behavioral biases of voters, might necessitate political bargains that are departures from revenue neutrality but put in place the architecture for a carbon tax.

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Appendix A

Table A1. Variables used in LASSO.

Name	Description
% Yes	% of "yes" votes on Initiative 732.
% White	% of residents identified as white.
% Male	% of residents identified as male.
% Housing Occupied	% of housing units in the area that were occupied.
% Unemployed	% of residents 16 and older who were unemployed.
% Not in LF	% of residents 16 and older not in the labor force.
% Armed Forces	% of individuals in the labor force in Armed Forces.
% Drove Alone	% of workers 16 and older who commute by driving alone.
% Carpool	% of workers 16 and older who commute by carpool.
% Public Transit	% of workers 16 and older who commute by public transit.
% Walk	% of workers 16 and older who commute by walking.
% Other Means	% of workers 16 and older who commute by other means.
% Work at Home	% of workers 16 and older who work at home.
Mean Commute	Mean travel time to work in minutes.
% Management	% of workers in management, business, science, and arts occupations.
% Service	% of workers in service occupations.
% Sales and Office	% of workers in sales and office occupations.
% Natural Resources	% of workers 16 and older in natural resources, construction, and maintenance.
% Production	% of workers 16 and older in production, transportation, and material moving.
% Agriculture	% employed agriculture, forestry, fishing and hunting, and mining.
% Construction	% employed in construction.
% Manufacturing	% employed in manufacturing.
% Wholesale	% employed in wholesale trade.
% Retail	% employed in retail trade.
% Transportation	% employed in transportation, logistics,warehousing, and utilities.
% Information	% employed in information.
% Finance	% employed in finance and insurance, real estate, and rental and leasing.
% Professional/Waste	% employed in professional, scientific, management, admin. and waste management.
% Educational	% employed in educational services, health care, and social assistance.
% Art and Hospitality	% employed in arts, entertainment, recreation, accommodation, and food services.
% Others	% employed in other services, except public administration.
% Public Admin	% employed in public administration.
% Private Workers	% employed as private wage and salary workers.

Table A1. *Cont.*

Name	Description
% Government	% employed in government.
% Self Employed	% employed who are self-employed.
% Family	% employed who are unpaid family workers.
Total Households	Total Households with Income and Benefits in thousands.
% Income over $200k	% of households with income and benefits $200,000 or more.
Median Household	Median household income in 2015 inflation-adjusted dollars in thousands.
Household Income	Mean household income in 2015 inflation-adjusted dollars in thousands.
% Earnings	% households with earnings.
% Social Security	% households with Social Security.
% Retirement	% households with retirement income.
% Public Assistance	% households with public assistance.
% SNAP	% households with food stamp/SNAP.
% Families w. Inc. Ben.	% of families with income and benefits.
% Native Born	% of residents place of birth the United States.
% Health Insur. <18	% of population under 18 with health insurance coverage.
% Health Insurance	% of those in labor force and employed with health insurance.
% Poverty Married	% below the federal poverty level that were married couple families.

% Yes was obtained from Washington Secretary of State [3]. All other variables obtained from the 2011–2015 American Community Survey 5-Year Estimates. Carbon Intensity and Climate Risk obtained from Hsiang et al. [39]. All employment variables refer to the civilian-employed population 16 years and over. All income variables are in 2015 inflation-adjusted dollars. Dollars are denoted in thousands.

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