

Who Joined the Pigou Club? A Postmortem Analysis of Washington State’s Carbon Tax Initiative I-732*

Soren T. Anderson[†]

Michigan State University and NBER

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Abstract

I document voting behavior in Washington State’s revenue-neutral carbon tax referendum of November 2016. The initiative (I-732) would have taxed carbon emissions from fossil fuels while simultaneously lowering the retail sales tax and certain manufacturing taxes and matching the federal Earned Income Tax Credit. Voters rejected I-732 with 41% voting for and 59% against. Precinct-level vote shares imply two-thirds support among Democratic voters and near-zero support among Republican voters, and the partisan vote alone explains 87% of the variation across precincts. Yet party is not everything, as incidence, identity, information, and ideology are all correlated with support for I-732. Support is weaker in precincts with larger shares of car commuters, bigger homes, and workers in carbon-intensive industries and stronger in precincts with larger shares of young people, racial and ethnic minorities, college-educated adults, and voters that are ideologically aligned with the left’s broader policy agenda. Out-of-sample forecasts imply that no other state would have passed I-732. Polling data suggest that framing the policy in terms of “fighting climate change” likely gained many Democrats but lost many Republicans. Less clear is the role played by elites: while many elected officials in the Democratic party supported I-732, the state Democratic party and leading environmental groups were all opposed. Overall, these results highlight a strategic fork in the road for politically feasible climate regulation: attract moderates through a revenue-neutral carbon tax, or veer left by directing tax revenue to projects that Democrats like.

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Key words: Pigouvian taxes, carbon taxes, voting behavior, public opinion surveys, state environmental policy

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[†]Email: sta@msu.edu

1 Introduction

Economic theory recommends imposing a Pigouvian tax on greenhouse gas emissions to internalize the damages associated with climate change—or capping emissions and allowing an emissions price to form indirectly via permit trading. Price incentives naturally equalize the marginal costs of reducing emissions across different emissions sources, thereby minimizing the total cost of meeting a given emissions target. Meanwhile, tax revenues can be used (“recycled”) to lower other distorting taxes or to mitigate the distributional impacts of higher energy prices. These results are well-known to economists. Yet current policy falls far short of this textbook ideal. As of 2016, less than 15% of global greenhouse gas emissions are covered by carbon pricing, and the emissions prices in most of these jurisdictions lie well below recent benchmark estimates for the social cost of carbon.¹ Why haven’t more politicians and the citizen-voters they represent joined the Pigou Club?² Who would join no matter what? And who might take more convincing?

I explore these questions through the lens of Washington State’s revenue-neutral carbon tax initiative I-732. Had it passed, I-732 would have taxed fossil-fuel emissions at \$25 per ton of carbon dioxide (rising to \$100 per ton) while lowering the state sales tax rate from 6.5% to 5.5%, eliminating certain taxes on manufacturing, and matching the federal Earned Income Tax Credit by 25%. Thus, the policy closely resembled various Pigouvian tax and revenue-recycling schemes whose efficiency and distributional impacts are of great interest to economists. The initiative was led by stand-up comedian and Ph.D. economist Yoram Bauman and his grassroots organization Carbon Washington. Bauman intentionally designed the policy to be revenue neutral—lowering distorting taxes while addressing distributional concerns—in an attempt to appeal to the widest-possible range of voters, including limited-

¹See here: <https://openknowledge.worldbank.org/bitstream/handle/10986/24288/CarbonPricingWatch2016.pdf?sequence=4&isAllowed=y> and https://www.epa.gov/sites/production/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf.

²Harvard economist Greg Mankiw coined the term “Pigou Club” in a 2006 blog post titled, “The Pigou Club Manifesto,” in which he informally offered Club membership to anyone that publicly declared his or her support for taxes on social and environmental bads to internalize externalities. See here: <https://gregmankiw.blogspot.com/2006/10/pigou-club-manifesto.html>.

government conservatives. Yet Washington’s voters rejected I-732, with 41% voting for and 59% against. Who among them joined the Pigou Club? And who declined to join?

I document the political life and death of I-732 based on media accounts, interviews with key players, and analysis of the final election results and pre-election polling data. Precinct-level voting data show that support for I-732 was highly partisan. Precinct-level vote shares show two-thirds support among precincts voting 100% Democratic or Green Party in the presidential election and virtually zero support among precincts voting 100% Republican or Libertarian. Regression results imply substantially higher support among Libertarians than Republicans and essentially unanimous support among Greens. Presidential vote shares alone explain 87% of the variation in precinct-level vote shares. Conditional on the presidential vote, support for I-732 is weaker in precincts with larger shares of car commuters, bigger homes, and workers in carbon-intensive industries and stronger in precincts with larger shares of young people, racial and ethnic minorities, college-educated adults, and voters that support the left’s broader policy agenda (e.g., higher minimum wages).

Would I-732 have passed in any other state? In a word: no. Out-of-sample forecasts based on presidential vote shares imply that no other state—assuming it had the same political and information environment as Washington in November 2016—would have passed I-732. Meanwhile, the states with the highest forecast vote shares, such as California and New York, already have carbon pricing via cap-and-trade programs.

Pre-election polling data from Washington suggest that the framing the policy in terms of “fighting climate change” likely gained many Democrats but lost at least as many Republicans. Polling data indicate that 25% of voters in both parties were still undecided on I-732 in the weeks leading up to the election. However, when asked about their support for a *generic* tax or cap on carbon emissions *in order to fight climate change*, this uncertainty evaporated, with most undecided Democrats now favoring carbon regulation and most undecided Republicans (and even some supporters of I-732) turning against.

This paper contributes to an increasingly relevant policy debate on the economic merits

and political feasibility of state-level carbon pricing. The Trump Administration has signaled that it will scale back federal efforts to curb greenhouse gas emissions, leading to a surge of interest in state-level carbon taxes and cap-and-trade systems. Most states under Democratic control already have cap-and-trade systems covering their entire economy (e.g., California) or their electric power sector (e.g., New York). Republican-controlled states seem unlikely to regulate carbon via a traditional legislative route. But many states under partial Republican control have quite balanced electorates and feature an alternative mechanism—the ballot initiative process—that would allow their citizens to enact climate legislation directly by proposing legislation, collecting a minimum number of signatures, and putting the legislation to a statewide referendum.

This paper also contributes to a large economics literature that studies the political economy of environmental policy (examples to be added) and substantial sub-literature that focuses either specifically on state and local referendums (examples to be added) or on carbon regulation (examples to be added). This paper is unique in focusing on a revenue-neutral carbon tax referendum, providing the most direct, revealed-preference evidence to date on how voters perceive such a policy.

This paper also contributes to a growing literature in political science on state-level carbon policies. See Rabe (2018) for a thorough review. This literature considers why states would choose to adopt carbon policies, given that the carbon concentration in the atmosphere is a global public good. This literature emphasizes the non-economic aspects. This literature also studies what has led such regulation to endure in some jurisdictions and disappear in others, emphasizing the salience of the benefits vs. costs (examples to be added).

Finally, this paper contributes to an gargantuan literature in political communication, social psychology, and public opinion that uses surveys to measure voter preferences for environmental policy and how these preferences depend on observable demographics and political and informational frames. Egan and Mullin (2017) survey the relevant public opinion literature on climate. This literature shows that most everyone is aware of climate change

as an issue. But support for policies to combat climate change varies considerably—and this support is highly correlated with belief in and concern about climate change across individuals. Partisan affiliation (i.e., Democrat vs. Republican) is the single-most important driver of support for climate regulation, and the partisan gap has only widened in recent decades. Meanwhile, demographics help explain support for regulation, but only at the margins.³ Thus, my results, which are broadly consistent with this literature, provide an initial data point—for a specific real-world policy—that can begin to ground this survey literature in actual, revealed-preference voting behavior.

The rest of this paper proceeds as follows. Section 2 offers a narrative discussion on the life of I-732 from its conception to the November 2016 election. Section 3 complements this narrative with a graphical and statistical analysis of voting behavior on I-732 based on precinct-level voting data and a rich set of complementary census demographic data. Section 4 forecasts hypothetical state-level vote shares on I-732 in *other* states based on the empirical relationship between support for I-732 and presidential vote shares within Washington. Finally, section 5 concludes with a discussion of lessons-learned and avenues for further research.

2 A revenue-neutral carbon tax in Washington

When Washington’s voters entered the ballot booths (or opened their absentee ballots) in November 2016, they were asked to choose local school board members, city council members, and representatives to the Washington State house and senate. They were asked to vote on a range of bond issues and other local referenda. They were asked to vote in statewide elections for U.S. President, U.S. Senator, and Washington’s governor. And they were asked to vote on eight statewide ballot initiatives covering a wide range of social, economic, and

³Egan and Mullin (2017) further emphasize the importance of partisanship as a moderating variable for the effects of education and framing, that belief is not particularly susceptible to information (i.e., the “information deficit” model does not apply), and that belief in climate change does not necessarily lead to support for policy action.

procedural issues—including, for the first time in any U.S. state, an initiative to tax carbon emissions from the combustion of fossil fuels (initiative I-732). In this section, I document the political life of I-732 from its conception to the November 2016 election.⁴

2.1 Carbon Washington

The I-732 campaign was spearheaded by Carbon Washington—a small grassroots organization led by Yoram Bauman, a professional stand-up comedian and Ph.D. economist by training.⁵ Bauman had a passion for both economic principles and environmental sustainability. His life’s dream, dating back at least 10–15 years, was to have a carbon tax in Washington, which he hoped would demonstrate the power of economic incentives to solve environmental problems—and serve as an example to other states and eventually the U.S. federal government to adopt a similar incentives-based approach. So over the years, Bauman began to assemble a small group of like-minded individuals with the relevant expertise in law, economics, and policy. This small group, along with a cohort of young, passionate volunteers, became Carbon Washington.

2.2 Policy details

Carbon Washington’s goal—textbook environmental economics—was to target the carbon externality directly through a tax, while using the tax revenue to address distributional concerns. Thus, I-732 featured a carbon tax that would phase-in over two years, starting at \$15/tCO₂ in year one (2017), rising to \$25/tCO₂ in year two, and then rising gradually at 3.5% per year to \$100/tCO₂ (inflation-adjusted in 2016 dollars). The tax base included

⁴This section—still very rough—is based on interviews with key players, media reports, and information and background compiled by Ballotpedia. See here: [https://ballotpedia.org/Washington_Carbon_Emission_Tax_and_Sales_Tax_Reduction,_Initiative_732_\(2016\)](https://ballotpedia.org/Washington_Carbon_Emission_Tax_and_Sales_Tax_Reduction,_Initiative_732_(2016)). Further details and references to be added later.

⁵Bauman styles himself as “The world’s first and only Stand-Up Economist.” See here: <http://standupeconomist.com>. He has coauthored a series of cartoon economics books, including *The Cartoon Introduction to Climate Change* (2014) and *The Cartoon Introduction to Economics: Volume One Microeconomics* (2010).

the carbon content of all fossil fuels (e.g., coal, natural gas, and transportation fuels like gasoline and diesel fuel) sold or used within the state, as well as the fuels used to generate the electricity consumed in Washington but imported from other states. Thus, the policy was functionally equivalent to an upstream tax on the carbon content of fossil fuels used or consumed in the state.⁶

Carbon Washington intended I-732 to be revenue-neutral. Climate change is politically polarized issue with a strong but not overwhelming majority of Democrats supporting aggressive regulation and a majority of Republicans strongly opposed. Strategically, Carbon Washington's goal with the revenue-neutral tax was to appeal to moderate Republicans in the hopes that at least *some* would vote in favor and nudge the vote share above 50%. They reasoned that moderate Republicans that cared about climate change would be amenable to a market-based approach but would be turned off if the revenue were used to dramatically increase government spending.

Following this strategy, I-732 planned to lower the state retail sales tax from 6.5% to 5.5%, returning revenue to all state consumers and (since the sales tax tends to be regressive) partially addressing the concerns that the carbon tax is regressive. To further address such concerns, I-732 planned to match the federal Earned Income Tax Credit at 25% to benefit low-income, working families. Carbon Washington thereby hoped to also earn the strong support of progressives that cared both about climate and income inequality. Finally, to address disproportionate impacts on carbon-intensive industries and mitigate strong political opposition and attack ads from these large, concentrated interest groups, I-732 planned to

⁶Administratively the policy piggy-backed on existing taxes and reporting of carbon emissions. Taxes on transportation fuels piggy-backed on existing fuel taxes. To tax electricity, the policy piggy-backed on the state's "Fuel Mix Disclosure Report" for electric utilities. This report requires utilities to report fuel sources for their electricity. The state uses this information to construct a measure of carbon emissions from each utility. Utilities report electricity obtained via contracts from specific power plants (for which fuel sources can be identified directly), electricity obtained from the Bonneville Power Administration (for which fuel sources can be identified directly), and power purchased on the spot market (for which fuel sources are cannot be identified directly). To calculate fuel sources for power purchased on spot market, the state starts with total generation in Northwest Power Pool (NWPP) and then subtracts out generation by plants specifically claimed in the disclosure report, leaving power available for purchase on the spot market. The state then estimates the average fuel sources and carbon emissions for this power.

eliminate the state’s business and occupation tax for manufacturers, which was as high as 0.484% for most industries.⁷

The clean, simple policy described in the paragraphs above belies the long and complicated process that Carbon Washington pursued to earn official certification from the state. Only after this certification—which yielded a specific ballot title, descriptive language, and numeric identifier (I-732)—was Carbon Washington able to circulate its petition for I-732 and begin collecting signatures. This bill-writing and certification process took several years and involved writing a specific bill (which required extensive legal and administrative expertise covering both the state tax code and the crafting of legislation), submitting the bill for review and interpretation (to ensure its constitutionality and determine “what the bill actually does” given potentially unforeseen interactions with existing state code), and then multiple iterations of revising and resubmitting the bill’s language both for content and emphasis (to ensure that the bill will have the intended impacts and to perhaps achieve more a more favorable ballot title). Most citizen’s initiatives in Washington (and in other states that allow them) follow a similar process.⁸

2.3 Ballot language and signatures

These multiple iterations of revise-and-resubmit (a process with which most academic readers will no-doubt be familiar) eventually converged to yield the final ballot title and summary for I-732:

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.

⁷The standard tax rate was 0.484%. A handful of manufacturing industries had lower taxes to begin with or were completely exempt and therefore experienced lower tax reductions or none at all as a result of the policy.

⁸A strikingly large percentage of Washington’s initiatives over the past two decades have been sponsored by one individual: Tim Eyman, a political activist that has successfully used the initiative process in an attempt to lower various (often obscure) state taxes and fees. See his Wikipedia bio here: https://en.wikipedia.org/wiki/Tim_Eyman.

Should this measure be enacted into law? Yes [] No []

This measure would impose a carbon emission tax on the sale or use of certain fossil fuels and fossil-fuel-generated electricity, at \$15 per metric ton of carbon dioxide in 2017, and increasing gradually to \$100 per metric ton (2016 dollars adjusted for inflation), with more gradual phase-in for some users. It would reduce the sales tax rate by one percentage point over two years, increase a low-income sales tax exemption, and reduce certain manufacturing taxes.

This is the language that would-be petition signers would have seen atop (perhaps, speaking from experience as a Michigan voter) a sweat-soaked, coffee-stained, and crumpled stack of previous signatures—in farmers markets, on street corners, or anywhere else that Carbon Washington’s canvassers stalked unsuspecting voters.⁹ Anecdotal evidence from canvassers suggests that these face-to-face interactions and opportunities for education can dramatically shift support for carbon taxes. For example, former Carbon Washington campaign manager Ben Silesky estimates that he personally collected more than 10,000 signatures. He further estimates that he was able to convince 25% of voters that initially declined to sign to change their minds after carefully explaining the economic logic behind Pigouvian taxation and revenue recycling (translated to non-economist speak, of course).

Carbon Washington’s canvassers collected signatures throughout 2015 (precise timeline to be confirmed) and eventually—and to the amazement of many old political hands in the state—collected more than the 350,000 signatures needed to gain access to the November 2016 ballot.¹⁰ Among all signatures collected, roughly a third were collected by unpaid volunteers, another third by part-time college students at \$1 per signature, and a final third by professional canvassers at \$3 per signature.¹¹ Suddenly, powerful environmental groups in the state that had previously ignored Carbon Washington began to take notice.

⁹It is also the ballot language that voters eventually saw in the voting booth—many if not most of them for the first time.

¹⁰The technical minimum is 246,372 valid signatures, which by law is set equal to 8% of the votes cast for governor in the most recent election. But the key is *valid* signatures. Canvassers inadvertently collect some invalid signatures, e.g. from nonresidents, voters registered elsewhere, or from multiple signatures from the same individual. Thus, a large cushion of signatures is needed to ensure the technical minimum is achieved.

¹¹Personal communication with Yoram Bauman.

2.4 Join the clean energy alliance, or go it alone?

The other (or rather “the”) big player in the state on carbon regulation was the Washington Alliance for Jobs and Clean Energy (henceforth “Alliance”). The Alliance comprised a broad range of environmental, labor, and racial and social justice advocacy groups, i.e. the progressive base. These members included heavy-hitting, national-level environmental advocacy groups, such as Sierra Club and National Resources Defense Council, along with various state and local environmental groups, such as the Washington Environmental Council. The labor and social justice groups reflected a similar range of national, state, and local advocacy groups—again including many heavy-hitters (e.g., AFL-CIO).¹² The Alliance’s overarching strategy was to explicitly tie carbon regulation to a program of spending on green jobs, improved health, and climate adaptation in low-income, historically disadvantaged communities, including communities of color. Thus, from the Alliance’s perspective, any tax (or emissions permit auction) revenue should be targeted to these priorities.

The Alliance’s alternative approach highlights a strategic fork in the road for crafters of climate policy: appeal to right-leaning Republican and Libertarian voters through a revenue-neutral, market-based policy in the hopes of attracting *enough* of them—or double-down on the political left’s Democratic and Green Party voters by spending on issues and identity groups progressives care about in the hopes of attracting *all* of them. Carbon Washington turned right (or rather, aimed for the middle), while the Alliance was veering left.

The Alliance, surprised by I-732’s success and concerned that it would undermine their efforts for climate regulation the state, approached Carbon Washington late in 2015 with a proposal: “Throw away your signatures and work with us instead.” The Alliance argued that I-732 did not poll particularly well and that a modified bill might fare better. But although they had a rough policy outline, the Alliance did not have a specific bill. It was not clear whether they would be able to negotiate a specific policy internally, craft a bill, and then

¹²See the Alliance’s web page for a statement of principals and list of members: <https://jobscleanenergywa.com>.

collect enough signatures before the deadline to get on the ballot. Carbon Washington was nonetheless persuaded by the Alliance’s offer and initially voted to withhold their signatures and collaborate with the Alliance. But in the subsequent weeks, no progress was made. And so Carbon Washington decided to back out of the tentative agreement and submit their signatures to the state—ensuring that I-732 would either be approved by the state legislature or appear on the November 2016 ballot.¹³ The die was cast.

2.5 Supporters and opponents

The campaign for I-732 took place throughout 2016 leading up to the November election. Supporters obviously included Carbon Washington itself, which spent \$1.9 million crafting the bill, collecting signatures, and promoting I-732. Most of this money was raised through small donations from private individuals. Audubon Washington contributed a \$1.25 million in total spending to support I-732. Additional support came from the Citizen’s Climate Lobby, many local Democratic party chapters, the renewable energy industry, miscellaneous environmental groups, and individual elected officials in Washington (see below).

Opponents included the usual suspects: business interests as represented by local chambers of commerce and various carbon-intensive industries, including mining, paper, fossil fuel extraction, utilities, agricultural and food processing, and trucking. This opposition was not surprising. But shockingly, opponents also included the state Democratic party, labor groups, social justice groups, and even several influential environmental advocacy groups—in short, the clean energy Alliance and the groups it represents. This opposition garnered a huge amount of press attention in the months leading up to the November 2016 election as another juicy case of the “left eating its own.”

The reasons for this opposition varied across groups but essentially boiled down to three issues: (1) concern that I-732, though designed to be revenue-neutral, might actually hem-

¹³In Washington, citizen’s initiatives may be considered by the state legislature for adoption. Bills that pass the legislature immediately become law and do not appear on the November ballot. If the legislature either declines to consider the legislation, or votes against the bill, then the bill goes on the November ballot to be considered via statewide referendum.

orrhage revenue and put crucial government support programs at risk;¹⁴ (2) a belief that carbon tax revenue should be *spent* on issues important to the broader progressive coalition (e.g., green jobs and climate adaptation) and evidence suggesting that such tax-and-spend schemes poll somewhat better than revenue-neutral approaches; and (3) the perception that Bauman and Carbon Washington failed to engage the broader social and environmental justice community in the design of I-732.

Sierra Club's (Washington Chapter) official position statement on I-732 contains a particularly cogent and explicit expression of this reasoning. I reproduce this statement in its entirety here:

September 2016

Sierra Club has adopted a Do Not Support position concerning Initiative 732, rather than Support, Neutral, or Oppose. Given the urgency of the climate crisis, this was not a decision reached lightly. Members of the Club expressed deep concerns that the initiative does not include all that is needed for an equitable climate policy and just transition to a clean energy economy, while at same time, other members of the Club worked tirelessly in support of the initiative. Sierra Club is taking a Do Not Support position because:

- Communities of color and low-income people are almost always the ones most impacted by pollution and climate change, and as a result they need to be at the front and center of discussions for how to address the problem and mitigate the impacts of both climate change and environmental policy. That wasn't the approach taken by I-732. As a result, the initiative fails to affirmatively address any of the stated needs of those communities: more investment in green jobs, energy efficiency, transit, housing, and renewable energy infrastructure.
- There remains justifiable concern about I-732's revenue projections. While I-732 was intended to be revenue neutral, the State Department of Revenue predicts I-732 will result in about \$200 million of lost revenue per year in its first four years. A subsequent analysis by Sightline Institute, a respected environmental think tank, found flaws in the state forecast but still estimated a nearly \$80 million annual revenue loss over the same time period. At a time when our state needs additional revenue to fund education, parks, environmental programs, and social services, we are concerned about any projected revenue cuts.

¹⁴Independent estimates of the revenue impacts varied, highlighting this uncertainty. The Washington Office of Financial Management projected a 0.95% decrease in state revenue. Carbon Washington projected a 1.1% to 1.6% increase. And the Sightline Institute projected a -0.27% decrease.

Whether I-732 passes or not, the Sierra Club is committed to working together as a movement after the election with our allies in the labor, social justice, immigrant, and Tribal communities to support efforts to stop climate change and preserve a clean, healthy environment for future generations.

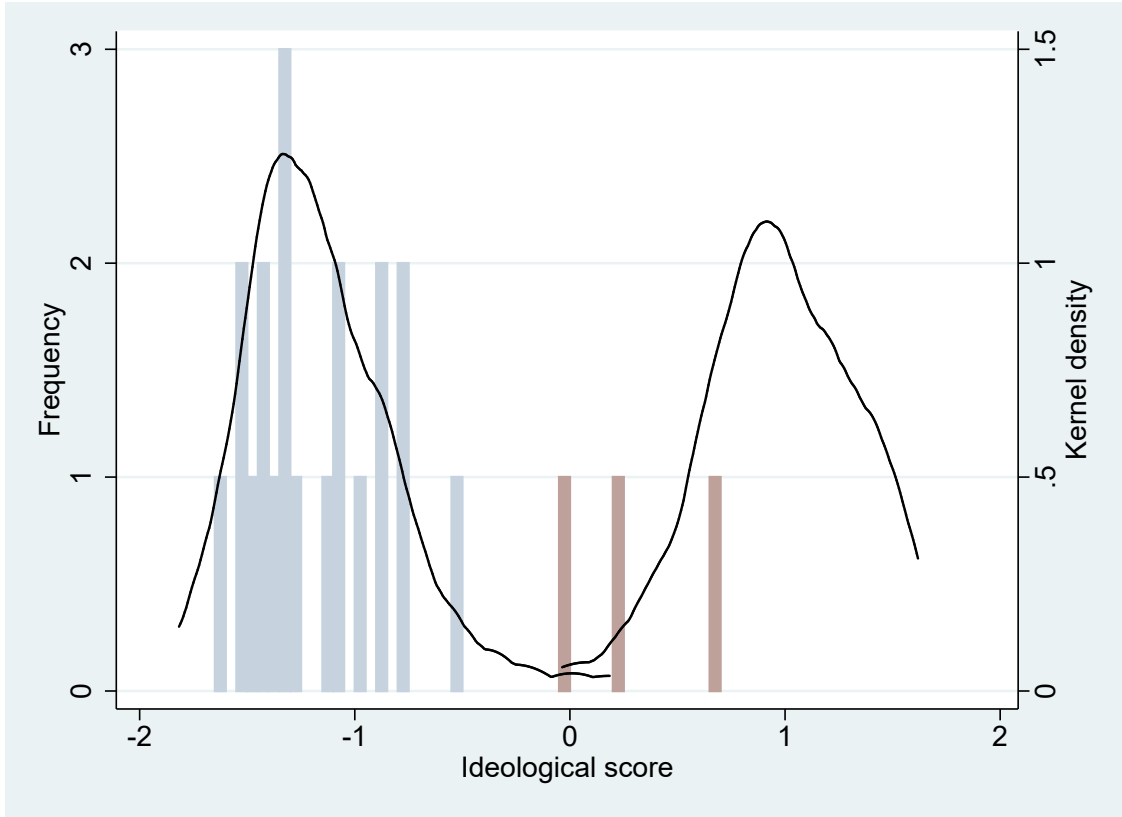
To what extent did Sierra Club’s concerns translate to lower vote shares from labor, social justice, immigrant, and Tribal communities in practice? This is a question I return to below in my regression analysis of precinct-level voting data.

2.6 Statements of support from elected officials

One of Carbon Washington’s explicit goals was to attract support from moderate Republicans to break the log-jam on climate regulation. Did they succeed? While I-732 was put to a statewide referendum, at least two-dozen elected officials expressed support for I-732, as reported by Ballotpedia. I collect these names and match them to estimated ideological scores from Shor and McCarty (2011, 2015) based on roll call votes in the Washington state legislature.¹⁵ Figure 1 shows the results. The horizontal axis measures ideological score. The blue bars show the histogram of the roughly two-dozen Democrats that expressed support for I-732, while the red bars show the histogram of the three Republicans. Meanwhile, the black lines show the pdfs of the ideological score for *all* of Washington’s state legislators during 1993-2014. The pdf on the left is for Democrats, while the one on the right is for Republicans. Thus, the figure shows that I-732 earned the support of three left-leaning Republicans and Democrats drawn from across the ideological spectrum. These results are consistent with Carbon Washington’s strategy to win Democrats while attracting at least *some* moderate Republicans. But was it enough?

¹⁵Shor and McCarty (2011) estimate ideological scores from roll call votes in Washington and other state legislators. Roll call votes allow them to estimate ideological scores “within” individual state legislatures and years. They use legislators that move between bodies, as well as legislators’ responses on common, nationwide surveys that inquire about policy positions to calibrate ideological scores that are valid “between” different legislative bodies and years. How does this procedure work? Intuitively, suppose that one group of legislators (A) nearly always votes together (or answers identically in a survey), that a second group (B) nearly always votes together in the opposite direction, and that a third group (C) sometimes votes with A and sometimes votes with B. Then we can infer that group A lies at one extreme of an ideological spectrum, that group B lies at the opposite extreme, and that group C lies somewhere in the middle.

Figure 1: Ideology of state legislators that supported I-732



Note: This figure shows the distribution of ideological scores for current and former (recent) state legislators in Washington that expressed support for I-732. The horizontal axis is an ideological score as estimated by Shor and McCarty (2011, 2015). The bars show the histogram of ideology for the Democrats (in blue) and Republicans (in red) that expressed support for I-732; the frequency counts for this histogram are on the vertical axis at left. For reference, the figure also shows (in black) kernel density estimates for the pdfs of ideology for *all* of Washington’s state representatives during 1993-2014 that are Democrats (left pdf) and Republicans (right pdf). The density values for these pdfs are shown on the vertical axis at right.

2.7 Individual voters in pre-election polls

It was not clear in the weeks leading up to the November 2016 election that any of the elite opinion described above had penetrated the general electorate. Only a small fraction of voters had even *heard* about I-732 let alone formed a well-thought-out position.¹⁶ Yet three state election polls from October 2016 suggested that I-732 was on the ropes. An Elway poll of 500 likely voters from October 2016—including a mix of self-identified Republicans, Democrats,

¹⁶Personal correspondence with Ben Silesky of Carbon Washington.

and Independents—indicated 40% for, 32% against, and 28% undecided. Among Democrats, 61% were for, 9% were against, and 30% were undecided. Meanwhile, among Republicans, 19% were in favor, 56% were against, and 25% were undecided. Independents were in-between. October 2016 polls by KOMO News & Strategies 360 and by YouGov & University of Washington showed roughly similar results. Thus, in spite of official ambivalence or even outright opposition from the elite progressive community, support broke along traditional partisan lines.

In the Elway poll, cross-tabs of support by party and gender indicate that men of both parties were more ideologically certain about their vote in the weeks leading up to the election. Democratic men were 67% for and 24% undecided, while Democratic women were 56% in favor and 35% undecided, with equal shares of Democratic men and women against (9% and 9%). Meanwhile, Republican men were 69% against and 14% undecided, while Republican women were 45% for and 35% undecided, with roughly equal numbers of men and women for (18% and 20%). Further, there is some evidence in all three October 2016 polls that support correlates as expected with age (younger people are more supportive) and that the partisan divide widens with education (leading to stronger support among Democrats, weaker support among Republicans, and fewer undecideds from both parties).

Finally, the KOMO News & Strategies 360 poll conducted in October 2016 provides speculative evidence that the framing (i.e., stated purpose) of I-732 may have influenced how voters perceived the policy. Early in the survey, respondents were asked specifically about their support for I-732 using its precise ballot title:

This proposal is called Measure 732 and concerns taxes. Here is the text of what will be on the ballot. “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.” If the election were held today and you were filling out your ballot right now, would you vote to support or oppose this proposal?

Then, later in the survey, respondents were asked about their support for climate regulation in general using language that often appears in climate opinion polling:

In order to fight climate change, would you support or oppose phasing in stronger limitations or new taxes on carbon emissions, even if it would gradually increase the cost of living in Washington

Note three differences in policy details and language experienced by survey respondents. First, the generic policy suggests either “limitations” or “new taxes” as potential instruments. Given that survey respondents tend to prefer cap-and-trade to new taxes, the generic policy might be expected to garner more support than I-732. Second, the generic policy would gradually increase the cost of living, whereas I-732 promises to lower other taxes—though by an unspecified amount. Third, the generic policy is *framed* in terms of fighting climate change, whereas I-732 is described without purpose or other context.

Table 1 shows that survey respondents perceived these questions quite differently. Among all respondents, there were many fewer undecideds on the generic language (just 6%) than on the earlier I-732 language (21%). This reduction in the share of undecideds (15%) broke roughly evenly in support of carbon regulation (from 42% to 48%) and against (from 37% to 46%). But these changes mask highly asymmetric responses across parties. Among Democrats, support for carbon regulation increases from 63% to 78% moving from the I-732 language to the generic language. Meanwhile, among Republicans, opposition increases from 56% to 80% against. These aggregate changes are driven almost entirely by a reduction in the aggregate share of undecideds—and a moderate reduction in the share of Republican supporters (from 22% to 17%).¹⁷ Overall, these results suggest that the specific language voters see in the voting booth—and the framing they carry with them—can dramatically influence how they perceive a policy.

¹⁷While the aggregate share of undecideds explains most of the difference in support on I-732 versus the generic language, the aggregate shares mask substantial “switching” for individual voters. Indeed, 18% of the respondents that supported the generic language said they were *against* the I-732 language, while 18% of the respondents that opposed the generic language said they were *for* it.

Table 1: Polling on preferences for carbon regulation

Coefficient	Democrat		Republican		All respondents	
	I-732	Generic	I-732	Generic	I-732	Generic
For	63	78	22	17	42	48
Against	18	18	56	80	37	46
Undecided	19	5	23	3	21	6

Note: This table shows shares of respondents that support either I-732 or generic carbon regulation in the KOMO News & Strategies 360 poll from November 2016. Table reports shares separately for Democrat respondents, Republican respondents, and all survey respondents.

3 Empirical analysis of precinct-level voting data

In this section, I complement the narrative and anecdotal evidence presented above with hard data. In particular, I document the correlation between voting on I-732 and the partisan (i.e., Democratic vs. Republican) vote using precinct-level elections data from November 2016—and I explore whether various measures of incidence, identity, information, and ideology correlate with support for I-732.

3.1 Precinct-level election data and ancillary data sources

My main data come from the State of Washington Secretary of State (WA SOS) and record precinct-level vote totals from the November 2016 election¹⁸ These data record the total number of votes for various candidates to elected office, as well as total votes for and against various state and local ballot issues. The total number of precincts is about 7,000. I use these data to calculate vote shares for the Democratic, Republican, Green, and Libertarian party in the U.S. presidential election and in other statewide elections, as well as shares voting “yes” vs. “no” on I-732 and other statewide ballot measures.

I match these voting data to U.S. Census tract-level data as follows. First, I obtain data from WA SOS that provides the distribution of each voting precinct’s population across Washington’s various census tracts and blocks. I use these data to calculate, for each precinct,

¹⁸Precinct-level data for King County come from the King County website, as WA SOS only reports aggregate results for all of King County.

the share of the population living in each of Washington’s roughly 1,500 census tracts. Second, I match these population shares to U.S. Census tract-level aggregate data (e.g., median household income or the share of households with income less than \$50,000). Third, for each precinct, I calculate the population-weighted averages of the tract-level data. Finally, I match these precinct-level weighted averages of the underlying tract-level data to precinct-level election data.¹⁹

U.S. Census data come from American Housing Survey (AHS) 5-year estimates for either 2012-2016 (for home value, number of rooms, and income) or 2011-2015 (for commute time, industry, age, gender, and race).²⁰ In constructing population-weighted averages of tract-level data, I prefer to use tract-level *shares* of people, households, or workers in different categories rather than tract-level medians. For example, I prefer to calculate the share of people age 40 and older or the share of households with income less than \$50,000 rather than median age and income.²¹

Table 2 lists variable names and corresponding summary statistics for the unweighted estimation sample of 6,921 precincts. I have defined each of these variables to range between zero and one. In general, these variables all reflect precinct-level voting or population shares.

The first six variables are precinct-level vote shares for I-732 various presidential candidates. *Carbon tax* is the share voting “yes” on I-732 among all “yes” and “no” votes. I ignore non-votes in calculating this vote share. *Democrat* is the share voting Democratic Party (Hillary Clinton) in the presidential election. Likewise, *Republican*, *Green*, and *Libertarian* are the shares voting Republican Party (Donald Trump), Green Party (Jill Stein), and Libertarian Party (Gary Johnson). In constructing these vote shares, I ignore non-votes,

¹⁹I merge data for King County separately from the rest of Washington’s counties as the King County elections data are formatted differently.

²⁰I plan to update the former set of variables with the newer data very soon. But I do not expect these updates to substantially change my results.

²¹A population-weighted average of a tract-level population share yields an unbiased estimate for precinct-level population share under the assumption that the overlapping and non-overlapping parts of the census tract have the same demographics on average. In contrast, a population-weighted average of tract-level medians does not yield an unbiased estimate for precinct-level medians.

Table 2: Summary statistics for estimation sample

VARIABLES	(1) Mean	(2) S.D.	(3) Min.	(4) Max.	(5) p25	(6) p50	(7) p75
Carbon tax (I-732)	0.408	0.136	0.000	0.857	0.310	0.396	0.491
Democrat & Green	0.565	0.202	0.039	1.000	0.412	0.557	0.711
Democrat	0.547	0.199	0.039	1.000	0.395	0.538	0.691
Republican	0.386	0.195	0.000	0.933	0.244	0.388	0.530
Green	0.018	0.013	0.000	0.167	0.010	0.016	0.024
Libertarian	0.049	0.021	0.000	0.192	0.035	0.048	0.061
Car commute	0.875	0.122	0.161	1.000	0.853	0.915	0.950
Ag & mining	0.032	0.066	0.000	0.701	0.001	0.008	0.028
Construction	0.061	0.033	0.000	0.245	0.037	0.057	0.081
Manufacturing	0.101	0.050	0.000	0.415	0.064	0.092	0.129
Transport & utilities	0.051	0.028	0.000	0.300	0.031	0.047	0.068
Home value \$200,000+	0.691	0.256	0.000	1.000	0.498	0.762	0.910
Rooms 6+	0.537	0.181	0.006	0.972	0.420	0.546	0.662
Income \$60,000+	0.546	0.165	0.000	0.940	0.425	0.548	0.677
Age 40+	0.488	0.097	0.016	0.849	0.428	0.490	0.550
Female	0.502	0.029	0.208	0.626	0.486	0.501	0.519
Black	0.030	0.048	0.000	0.428	0.004	0.012	0.034
American Indian	0.013	0.042	0.000	0.732	0.001	0.005	0.012
Asian	0.076	0.087	0.000	0.635	0.014	0.045	0.109
Other or Multiracial	0.047	0.029	0.000	0.213	0.027	0.043	0.061
Hispanic or Latino	0.104	0.115	0.000	0.880	0.042	0.067	0.121
Bachelor's degree	0.223	0.108	0.008	0.527	0.134	0.202	0.307
Ideological score #1	0.477	0.177	0.000	1.000	0.354	0.454	0.571
Ideological score #2	0.705	0.071	0.000	1.000	0.659	0.707	0.754

Note: This table presents summary statistics for the estimation sample of 6,921 precincts across 39 counties. See text for details.

write-ins, and votes cast for other parties as represent a tiny share of the total.²² Thus, vote shares for the four largest parties sum to one within each precinct. *Democrat & Green* is the share voting either Democratic or Green; one minus this number is the share voting Republican or Libertarian. I similarly calculate “yes” vote shares for other ballot measures and Democrat vote shares (among all Democrat and Republican votes) in other statewide elections (i.e., U.S. Senate and Governor).

The next eight variables, all based on the U.S. Census, are intended to capture the incidence of the carbon tax. *Car commute* is the share of a precinct’s workers that commute

²²I plan to explore these outcomes in future extensions.

by car. One minus this number is the share that commute via other means or work from home. *Ag & mining, Construction, Manufacturing,* and *Transport & utilities* are the shares of a precinct’s workers that are employed in these various industries. Note that oil and natural gas extraction is included in the *Ag & mining* category. The omitted reference group includes a broad range of service industries.²³ *Home value \$200,000+* is the share of owner-occupant households that have home value of \$200,000 or greater. *Rooms 6+* and *Income \$60,000+* are the shares of all households that have homes with six or more rooms and income of \$60,000 or greater.

The next eight variables, all based on the U.S. Census, are intended to capture identity and information. *Age 40+* is the share of a precinct’s population that is 40 or older, while *Female* is the share that is female. *Black, American Indian,* and *Asian* are the shares of the non-Hispanic population identified as single-race Black, American Indian, or Asian, while *Other or Multiracial* is the share of the non-Hispanic population identified as some other race or by two or more races (of any combination). *Hispanic or Latino* is the share identified as Hispanic or Latino. The excluded category is therefore the share of a precinct’s population identified as single-race non-Hispanic white. I define one minus this number as the share non-white, i.e. people of color.²⁴ *Education* is the share of a precinct’s population that holds a bachelor’s degree.

Finally, the last two variables are intended to capture ideology. These variables are the first two components from a principal component decomposition of precinct-level vote shares

²³I have abbreviated these category names. The Census definitions are: “Agriculture, forestry, fishing and hunting, and mining,” “Construction,” “Manufacturing,” and “Transportation and warehousing, and utilities.” The service industries include: “Wholesale trade,” “Retail trade,” “Information,” “Finance and insurance, and real estate and rental and leasing,” “Professional, scientific, and management, and administrative and waste management services,” “Educational services, and health care and social assistance,” “Arts, entertainment, and recreation, and accommodation and food services,” “Other services,” and “Public administration.”

²⁴I have abbreviated these category names. The Census definitions are: “White (one race) not Hispanic or Latino”; “Black or African American (one race) not Hispanic or Latino”; “American Indian or Alaska Native (one race) not Hispanic or Latino”; “Native Hawaiian or Other Pacific Islander (one race) not Hispanic or Latino,” “some other race (one race) not Hispanic or Latino,” and “two or more races Not Hispanic or Latino” (which group as “Other or Multiracial”); and finally “Hispanic or Latino (of any race).”

on eight *other* ballot measures from November 2016.²⁵ These initiatives covered a wide range of social, economic, and procedural issues. Some initiatives mainly appealed to liberals while others mainly appealed to conservatives.²⁶ I linearly transform each variable to range from zero to one, i.e. I subtract the minimum value and then divide by the range (i.e., maximum minus minimum).²⁷

3.2 Graphical analysis

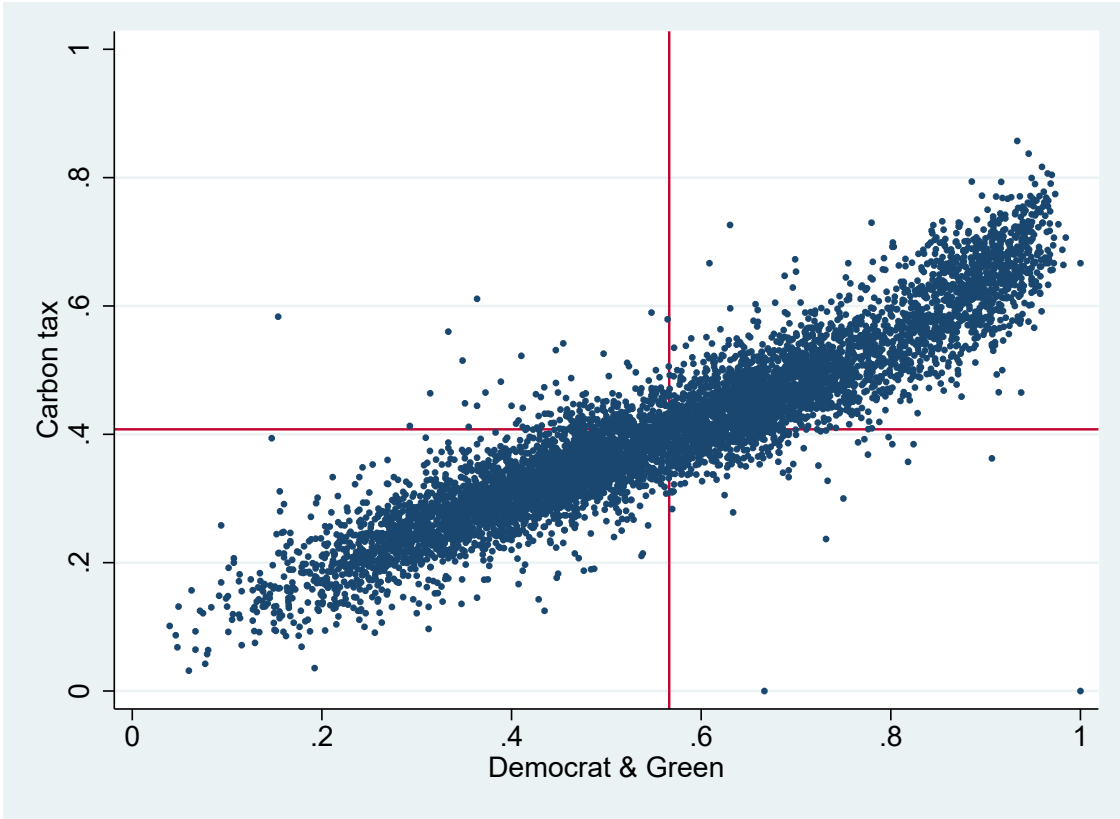
Figure 2 shows the raw correlation between the share voting “yes” on I-732 as measured by the *Carbon tax* variable and the U.S. presidential vote share as measured by the *Democrat & Green* variable. The red lines show the weighted-mean vote shares for both variables, i.e. the statewide vote shares on the carbon tax initiative (40.7%) and for the Democratic or Green Party for president (56.6%). The correlation between these variables is striking and almost perfectly linear. A non-parametric, locally linear (LOWESS) regression reveals little curvature, save a slight upward bend at about 75% vote share for Democratic or Green Party (see figure 6 in the appendix). A simple OLS regression through these data yields an intercept of 0.055 and a slope of 0.625. These results imply that the carbon tax garnered 5.5% support in a hypothetical precinct voting 100% Republican or Libertarian and $62.5\% \cdot 1 + 5.5\% = 68\%$ support in a hypothetical precinct voting 100% Democrat or Green Party. Note that these precincts are not all that hypothetical, as the *Democrat & Green* variable ranges from 4% to 100%. See table 2. These correlations look similar when I repeat the analysis using

²⁵I only include the first two components, as these two variables capture most of the underlying variation in ideology. In addition, including all eight components is statistically equivalent to controlling for vote shares on all eight of the underlying ballot initiatives.

²⁶These measures include a constitutional amendment to reserve rights for people and not corporations, a bill to raise the minimum wage, a constitutional amendment to create a state campaign finance system, a bill to let judges revoke firearm access for dangerous individuals, a bill to increase penalties for committing identify theft or fraud against vulnerable people, a bill to repeal a tax on stand-alone adult dental plans, a bill to repeal a clean car subsidy, and a constitutional amendment to accelerate the state deadline for completing the redistricting process. See figure 8 in the appendix for scatter diagrams plotting vote shares on all nine state ballot measures (including I-732) versus the presidential vote share.

²⁷Figure 5 in the appendix shows the distribution of the first component for precincts with a second component below the median value (blue) and above the median value (red). Full statistical results to be added soon.

Figure 2: Vote share on I-732 vs. Presidential vote



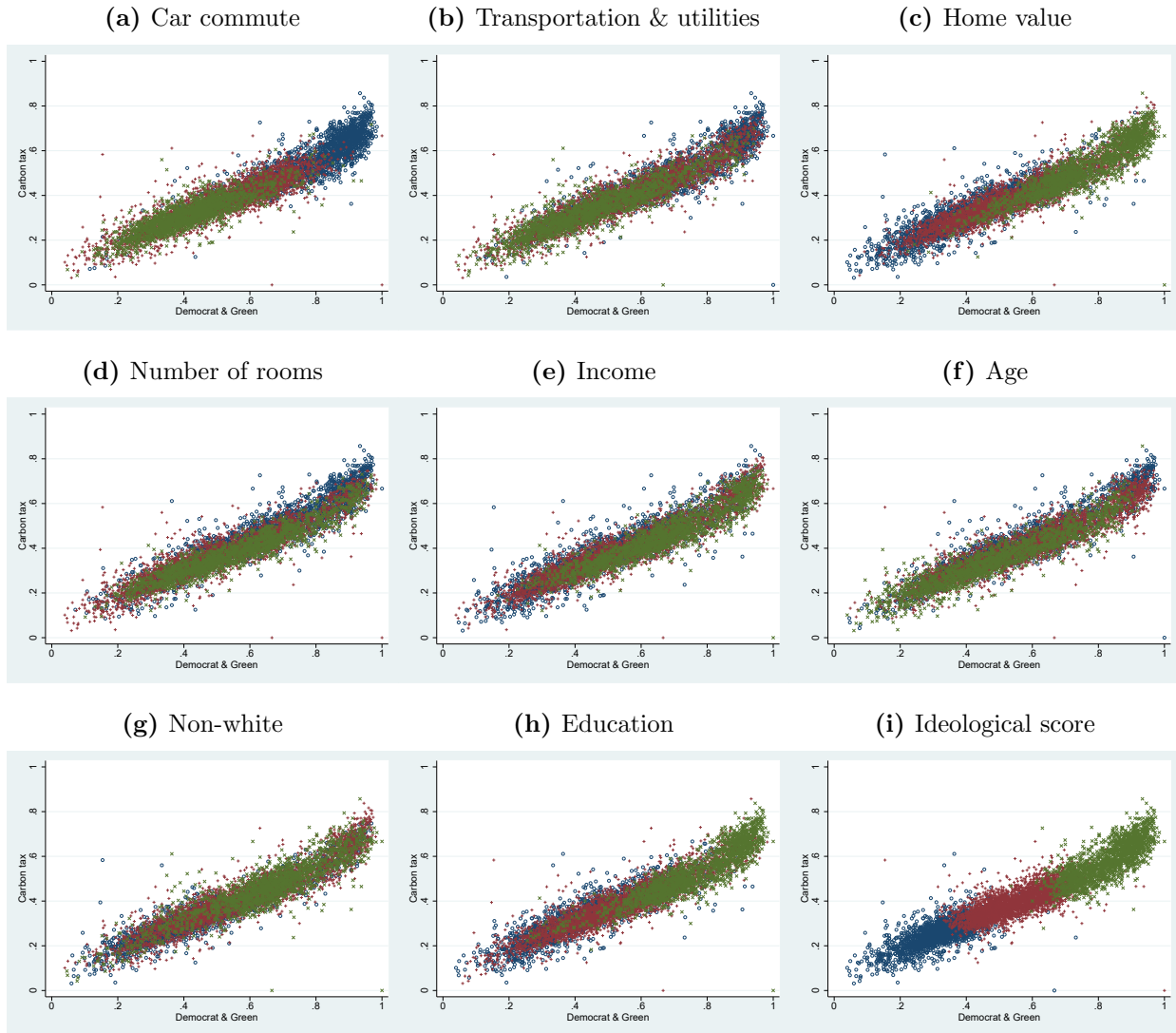
Note: This figure plots the “yes” share on I-732 versus the U.S. presidential vote share (Democratic plus Green Party) for 6,921 precincts in Washington State. See text for details.

Democratic vote shares for U.S. Senate or Governor (see figure 7 in the appendix).

The partisan vote explains 87% of the variation in support for I-732 across precincts. What then explains the remaining 13%? Figure 3 explores this question by plotting support for I-732 vs. the presidential vote separately for precincts with low, medium, and high values of different covariates that capture different drivers of support for I-732, i.e. incidence, identity, information, and ideology. Different sub-figures repeat this exercise for different covariates. Different colors correspond to covariate values in the bottom quartile (blue), middle two quartiles (red), and top quartile (green),

Across all of these figures, there is zero visual correlation between precinct-level covariates and support for carbon taxes *conditional* on presidential vote shares. That is, if one

Figure 3: Precinct-level vote by covariates



Note: Figures show correlations between “yes” vote share on I-732 and presidential vote share. Different colors indicate covariate values in the bottom quartile (blue), middle two quartiles (red), and top quartile (green). In the case of subfigures (a), (b), and (h), these quartiles are all based on the 25th and 75th percentiles for the precinct-level shares of car commuters (85% and 95%), transportation or utility industry workers (3.1% and 6.8%), holders of a bachelor’s degree (13.4% and 30.7%), and non-white population (14.6% and 35.4%). In the case of the remaining subfigures (c), (d), (e), (f), (g), and (i), the quartiles are based on the 25th and 75th percentile of home value (\$200,700 and \$390,300), number of rooms (5.1 and 6.4), income (\$49,794 and \$83,064), and age (35.2 and 43.6)—all precinct-level medians—and ideological score (0.354 and 0.572). Note that these percentile values also appear in table 2 for figures (a), (b), (h), and (i). Recall that the precinct-level medians are calculated as population-weighted averages of census-tract medians.

imagines visually fitting a regression line through the red, blue, and green data while imposing the same slope but allowing different intercepts, the three intercepts would be nearly the same. The covariates are, of course, highly correlated with the presidential vote share in some cases—and therefore highly correlated with voting on I-732. One extreme example is aggregate voter ideology as revealed by the principal component decomposition. See figure 3(i), which shows a near-perfect correlation (in color) between aggregate ideology and the presidential vote share. Another similar example is the share of workers that commute by car, which is strongly correlated with urban vs. rural. See figure 3(a). But these color-coded correlations all fade in importance after controlling for the presidential vote.²⁸

What explains this lack of visual correlation? Perhaps the top, middle two, and bottom quartiles do not differ all that much, i.e. there is little underlying variation in the covariates. See, for example, the 25th versus 75th percentile for *Female* in table 2. Or perhaps the conditional correlation between the covariates and support for I-732 is weak. Or perhaps the eyes simply cannot detect a conditional correlation in this crude graphical analysis based on 7,000 overlapping data points. All plausible. To address these concerns, I now turn to a formal regression analysis.

3.3 Regression analysis

Table 3 shows the results of eight regression specifications. Specification (1) corresponds to a simple OLS regression fit to the data in figure 2, which combines Democratic with Green Party voters and Republican with Libertarian Party voters. Specification (2) splits the presidential vote by Democratic, Green, and Libertarian Party shares. Specification (3) then adds census covariates. Specification (4) then adds controls for ideology based on voting on *other* statewide ballot initiatives. Specifications (5)-(8) repeat these specifications while including county fixed effects.

²⁸The near-perfect correlation between the presidential vote and ideology shown (in color) in figure 3(i) implies that I could repeat this graphical analysis using ideological score as the main conditioning variable. Using the presidential vote allows me to extrapolate my results to *other states* for which I observe presidential vote shares but not ideological scores. See below.

First consider specification (1). The R-squared indicates that Democratic plus Green Party vote share alone explains almost 87% of the variation in support for I-732. As noted above, the coefficient on the intercept (constant) term indicates 5.5% support for I-732 in a hypothetical precinct voting 100% Republican or Libertarian, while the slope and intercept coefficients together indicate $62.5\% \cdot 1 + 5.5\% = 68\%$ support in a hypothetical precinct voting 100% Democrat or Green Party. Assume that a Democrat is a Democrat (on average) regardless of whether she lives in say Seattle or Spokane, Yakima or Walla Walla—and similarly for Republican, Green, and Libertarian Party voters. Then we can say that 5.5% of Republican & Libertarian Party voters and 68% of Democratic & Green Party voters on average supported I-732. Of course, Seattle is no Walla Walla—so maybe Republicans and Democrats in Seattle voted differently on I-732 than their counterparts in Walla Walla. To address this concern, I re-estimate the model including county fixed effects, such that I only use within-county variation in precinct-level vote shares to identify the slope coefficient. I find strikingly similar slope coefficients. This test, while not dispositive, suggests that the coefficient estimates in table 3 approximately reflect average voting behavior on I-732 among voters for different parties.

Now consider specification (2). Considering Democratic, Republican, Green, and Libertarian Party vote shares separately only marginally increases the regression R-squared, presumably because Green and Libertarian Party shares are quite low on average. The intercept implies 3.6% support among Republicans, while the slope coefficients imply 62.1% higher support among Democrats, 18.9% higher support among Libertarians, and—if we take the 1.269 coefficient literally—more-than-unanimous support among Green Party voters. What’s up with these Greens? One possibility is a noisy estimate (note the standard error of 25.9%). A second possibility is that this interpretation implicitly represents a massive out-of-sample forecast—the sample maximum Green Party vote share is only 16.7%. Finally, a third possibility—and the same caution goes for all of my regression results—is that the correlation between aggregate precinct-level votes is *not* equal to the correlation

Table 3: Correlates of precinct-level vote on I-732

Coefficient	Without county fixed effects				With county fixed effects			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democrat & Green	0.625 (0.016)				0.659 (0.042)			
Democrat		0.621 (0.014)	0.533 (0.014)	0.129 (0.028)		0.651 (0.041)	0.542 (0.019)	0.134 (0.028)
Green		1.269 (0.259)	0.917 (0.132)	0.218 (0.087)		1.302 (0.179)	0.884 (0.121)	0.229 (0.071)
Libertarian		0.189 (0.107)	0.208 (0.049)	0.074 (0.036)		0.231 (0.066)	0.197 (0.036)	0.101 (0.039)
Car commute			-0.151 (0.012)	-0.097 (0.014)			-0.148 (0.010)	-0.094 (0.010)
Ag & mining			-0.085 (0.037)	0.001 (0.033)			-0.076 (0.033)	0.002 (0.027)
Construction			-0.058 (0.026)	-0.023 (0.024)			-0.069 (0.019)	-0.038 (0.017)
Manufacturing			0.002 (0.033)	0.012 (0.028)			-0.036 (0.035)	-0.039 (0.025)
Transport & utilities			-0.068 (0.036)	-0.021 (0.038)			-0.061 (0.022)	-0.039 (0.030)
Home value \$200,000+			-0.009 (0.012)	-0.016 (0.010)			-0.022 (0.006)	-0.018 (0.008)
Rooms 6+			-0.043 (0.007)	-0.024 (0.005)			-0.041 (0.006)	-0.028 (0.004)
Income \$60,000+			-0.020 (0.011)	-0.016 (0.014)			-0.009 (0.008)	0.001 (0.009)
Age 40+			-0.067 (0.014)	-0.044 (0.010)			-0.081 (0.012)	-0.045 (0.009)
Female			0.033 (0.026)	0.014 (0.021)			0.016 (0.025)	0.005 (0.021)
Black			-0.016 (0.016)	-0.016 (0.019)			0.008 (0.013)	-0.004 (0.014)
American Indian			-0.099 (0.028)	-0.018 (0.019)			-0.106 (0.026)	-0.028 (0.021)
Asian			-0.010 (0.008)	0.036 (0.006)			0.002 (0.004)	0.036 (0.005)
Other or Multiracial			-0.013 (0.039)	-0.027 (0.023)			0.017 (0.026)	0.026 (0.022)
Hispanic or Latino			0.017 (0.025)	0.041 (0.019)			-0.016 (0.017)	0.015 (0.012)
Bachelor's degree			0.035 (0.015)	0.107 (0.012)			0.039 (0.012)	0.090 (0.014)
Ideological score #1				0.493 (0.039)				0.493 (0.040)
Ideological score #2				0.272 (0.020)				0.294 (0.017)
Constant	0.055 (0.011)	0.036 (0.009)	0.281 (0.020)	0.007 (0.022)	0.035 (0.024)	0.017 (0.023)	0.295 (0.019)	-0.005 (0.023)
R-squared	0.865	0.869	0.898	0.926	0.765	0.772	0.821	0.870

Note: This table shows regression results for 6,921 precincts in 39 counties. Dependent variable is the share voting “yes” (vs. “no”) on I-732. Standard errors are clustered at the county level, i.e. robust to arbitrary heteroskedasticity and spatial correlation within counties. See text for details.

between individual-level votes (the so-called “ecological fallacy”). Thus, I am taking some liberties in the “precinct as individual” interpretation.

Next consider specification (3), which adds the census covariates. The R-squared increases to 89.8%, so the covariates have *some* explanatory power after conditioning on the presidential vote. Moreover, my proxy measures of incidence, identity, and information all seem to matter in ways we might expect. Plowing ahead with the “precinct as individual” interpretations for convenience, the coefficients imply that support for I-732 is 15.1% lower among car commuters. Meanwhile, support is 8.5% lower among agricultural and mining workers, 5.8% lower among construction workers, and 6.8% lower among transportation and utility industry workers—all relative to workers in various service industries. Finally, support is 1% lower among households with homes valued more than \$200,000 (not statistically significant, i.e. different from zero), 4.3% lower for households with six or more rooms, and 2% lower among households with annual incomes greater than \$60,000 (marginally statistically significant). Thus, support is weaker in precincts with more cars, workers in carbon-intensive industries, and bigger homes—where the incidence of I-732 is likely to be more negative.

Continuing with specification (3), support is 6.7% lower among residents age 40 and older and 3.3% higher among females (not statistically significant). Meanwhile, support is 1.9% lower among blacks, 1% lower among Asians, and 1.7% higher among Latinos—all relative to whites—but none of these coefficients is statistically significant. Support is 9.9% lower among American Indians but this is the smallest of the racial groups. Thus, while the dominant media narrative in Fall 2016 focused on internecine conflicts over identity politics, it does not appear that people of color—or rather, precincts with large people-of-color populations—voted disproportionately against I-732.

Rounding out specification (3), support is 3.5% higher among people holding bachelor’s degrees. Thus, it appears that education or access to information is important in driving support for I-732. These results are somewhat at odds with the broader climate change opinion survey literature, which emphasizes (1) a weak overall correlation between education

support for carbon regulation, and (2) a widening gap between Democratic and Republican-leaning voters at higher levels of education (Egan and Mullin 2017). I find in my data that these results are fragile and not robust to the inclusion of a richer set of control variables.²⁹

Next consider specification (4), which adds controls for ideology. The regression R-squared increases further to 92.6%. Thus, even controlling for the presidential vote a rich set of precinct-level census variables, ideology as reflected in voting on *other* ballot initiatives is highly predictive of voting on I-732. The coefficient on the first component of the ideological score implies that moving from one ideological extreme (“far right”) to the other (“far left”) correlates with a 49.3% increase in support for I-732. The coefficient on the second component implies an effect about half as large.

Figure 3(i) demonstrates a near-perfect correlation between ideology and the presidential vote. Not surprisingly, therefore, the coefficients on the presidential vote shares all shrink dramatically after controlling for ideology in specification (4). Indeed, they shrink so much that one suspects ideology would more powerfully predict support for I-732 than even the presidential vote.³⁰ Meanwhile, the coefficients on the incidence, identity, and information (education) variables shift a bit. The coefficient on car commuting shrinks by a third but remains statistically significant. The coefficients on industry shares keep the same signs but shrink in magnitude and are no longer statistically significant. The coefficient on home size (i.e., 6+ rooms) shrinks by half but remains statistically significant. Support among Asians and Latinos is now higher than among whites, and these differences become statistically significant. Meanwhile, opposition among American Indians abates substantially and becomes statistically insignificant. Finally, support among the college educated is now thrice

²⁹In the first iteration of my regression analysis, I was only able to control for car commute, income, home value, age, and education. As in prior literature, I found that the overall correlation between education and support for I-732 was quite weak in this sparse specification—but that the partisan gap widened with education (i.e., education was negatively correlated with support among Republicans and positively correlated with support among Democrats). My finding of a strong overall correlation between education and support for I-732 only emerged after I added further covariates to capture economic incidence (e.g., industry) and identity (e.g., race). Meanwhile, I found that adding these covariates tended to mute the widening partisan gap at higher levels of education.

³⁰Exploring this issue tops my list of empirical next steps.

as strong. Overall, these results point to a key role of political ideology—in addition to partisan affiliation and various proxies of incidence, identity, and information—in driving support for carbon taxes.

Finally, consider specifications (5)–(8), which add county fixed effects to otherwise identical specifications (1)–(4). The coefficients are remarkably similar across specifications that do and do not include county fixed effects.

4 Would I-732 have passed in any other state?

In a word: no. To arrive at this answer, I construct a set of 50 out-of-sample forecasts for the hypothetical statewide vote on I-732 by the applying coefficients from a regression of the precinct-level vote in Washington State to the observed presidential vote shares in all 50 states. My procedure is as follows.

First, to ensure forecasted vote shares between zero and one, I transform the dependent variable: $y_i = \ln(s_i/(1-s_i))$, where y_i is the logged odds ratio and s_i is the share voting “yes” on I-732 in precinct i . That is, I estimate a logistic vote share model. Second, I re-estimate specifications (1) and (2) from table 3 using this transformed dependent variable, i.e. the vote on I-732 as a function of presidential vote shares without covariates. Third, I apply the estimated coefficients from specification (2) to presidential vote shares for all 50 states to forecast the logged odds ratio in these states.³¹ Finally, I invert the logistic transformation to generate a forecast in levels.³²

Table 4 shows the coefficient estimates from my logistic vote shares model—along with corresponding marginal effects calculated at the sample mean vote share of 40.7% on I-732. For comparison to table 3, I estimate specifications with and without county fixed effects.

³¹A more sophisticated analysis might apply the coefficients from a regression using precinct-level vote shares in Washington to presidential vote shares from various sub-state units of geography from other states, such as precincts, legislative districts, or counties. Likewise, the first-stage Washington regression could also be conducted at the level of legislative district or county. Incorporating covariates from other state geographies would yield yet a further refinement.

³²The forecast share in levels is $\hat{s}_i = \frac{e^{\hat{y}_i}}{1+e^{\hat{y}_i}}$, where \hat{y}_i is the OLS forecast for the logged odds ratio.

Table 4: Correlates of precinct-level vote on I-732

VARIABLE	Without county fixed effects				With county fixed effects			
	(1) Coeff.	(1) MFX	(2) Coeff.	(2) MFX	(5) Coeff.	(5) MFX	(6) Coeff.	(6) MFX
Democrat & Green	2.787 (0.039)	0.673			2.923 (0.123)	0.706		
Democrat			2.802 (0.037)	0.677			2.926 (0.121)	0.707
Green			5.682 (1.014)	1.372			5.609 (0.706)	1.355
Libertarian			1.655 (0.554)	0.340			1.629 (0.397)	0.393
Constant	-1.978 (0.033)		-2.119 (0.034)		-2.055 (0.070)		-2.185 (0.066)	
R-squared	0.860		0.866		0.757		0.766	

Note: Sample size is 6,920 precincts in 39 counties. Dependent variable is the logged odds ratio for share voting “yes” (vs. “no”) on I-732.

Thus, the marginal effects for specifications (1), (2), (5), and (6) compare directly to linear coefficients for the same specifications in table 3 and have similar magnitudes.³³

Figure 4 plots the resulting state-level forecasts for “yes” on I-732 versus the observed presidential vote shares in each state.³⁴ For reference, the red lines again indicate vote shares on I-732 and in the presidential election in Washington State.³⁵ Note that the figure cuts off at a 50% yes share on I-732. Thus, I forecast that *no other state* would have passed I-732. This forecast implicitly assumes that Washington’s precincts are microcosms of U.S. states and that voters in other states hypothetically are confronted with identical ballot language, voter guides, media exposure, and so forth leading up to the November 2016 election. The forecast further assumes that Democrat, Republican, Green, and Libertarian Party voters in Washington are the same as elsewhere, such that the coefficients can be applied to these

³³Marginal partial effects given the logistic specification are $\frac{\partial s_i}{\partial x_i} = \beta s_i(1 - s_i)$, where s_i is the vote share on I-732 in precinct i and x_i is the relevant vote share in the presidential election. The table reports marginal partial effects for s_i equal to the sample mean of 0.407. Alternatively, I could calculate the marginal partial effect for each precinct separately and take the sample mean. I plan to do so in the next draft.

³⁴Note that the individual state forecasts do not lie along a smooth line due to variation in the composition of Democratic vs. Green Party and Republican vs. Libertarian vote shares across states. A forecast based on specification (1), i.e. the vote share for the Democratic and Green Party combined, would yield state-level forecasts along a smooth line.

³⁵Note that the forecast for Washington is nearly identical to the actual vote in that state. A linear forecast in levels would, given proper weights, yield a perfect match.

that Hawaii (1st), Washington (7th), Illinois (8th), Oregon (10th), New Jersey (12th), New Mexico (14th), Colorado (15th), Virginia (18th), and Minnesota (19th) are ripest for carbon pricing initiatives. How ripe? Well the U.S. Climate Alliance—a coalition of states that committed to meeting the Paris Climate Accord’s abatement goals in the wake of the U.S. federal government’s decision to withdraw—includes California, six of nine RGGI states, and Hawaii, Washington, Oregon, Colorado, Virginia, Minnesota, and North Carolina (26th).³⁶

5 Conclusion and discussion

I empirically document the precinct-level vote in Washington’s revenue-neutral carbon tax initiative I-732. While a handful of moderate Republican elites supported the policy, the Republican rank-and-file did not share their enthusiasm. Likewise, key Democratic and progressive elites opposed the policy, but the Democratic rank-and-file did not follow. Instead, I find that the vote broke largely along traditional partisan and ideological lines—with only a marginal role left for economic incidence, identity, and information. An out-of-sample forecast suggests that no other state would have passed I-732. Overall, my results help ground an extensive public opinion survey literature on climate regulation in actual, revealed-preference voting behavior for one specific policy. As far as I know, mine are the first revealed-preference estimates on voter preferences for carbon pricing that exist in the literature.

Could a different policy have succeeded with Washington’s voters? Perhaps. Amdur, Rabe, and Borick (2014) show that a carbon tax with unspecified use of revenue draws 34% support overall, while using the revenue to reduce the deficit, redistribute the revenue lump-sum, or fund clean energy R&D respectively boosts support to 38%, 56%, and 60%. More recently, Mills, Rabe, and Borick (2015) show that a generic *cap-and-trade* program draws 35% support, while auctioning permits and using the revenue to fund energy-efficiency

³⁶See here for a list of alliance members, a statement of principles, and further background: <https://www.usclimatealliance.org/>. Maryland, Maine, and New Hampshire are the only RGGI states that are not alliance members—and note that Maine and New Hampshire have the lowest forecast vote shares among RGGI states.

programs, expand renewable energy, and reduce other taxes boosts support by 12%, 9%, 6%. Both studies find that support among Republicans is particularly sensitive to how the tax and auction revenue is used. Further research should systematically explore how support for a carbon tax among Democrats vs. Republicans (or liberals vs. conservatives) varies with how the tax revenue is spent. These results could then be used to identify the policy or policies that garner the highest support in different jurisdictions.

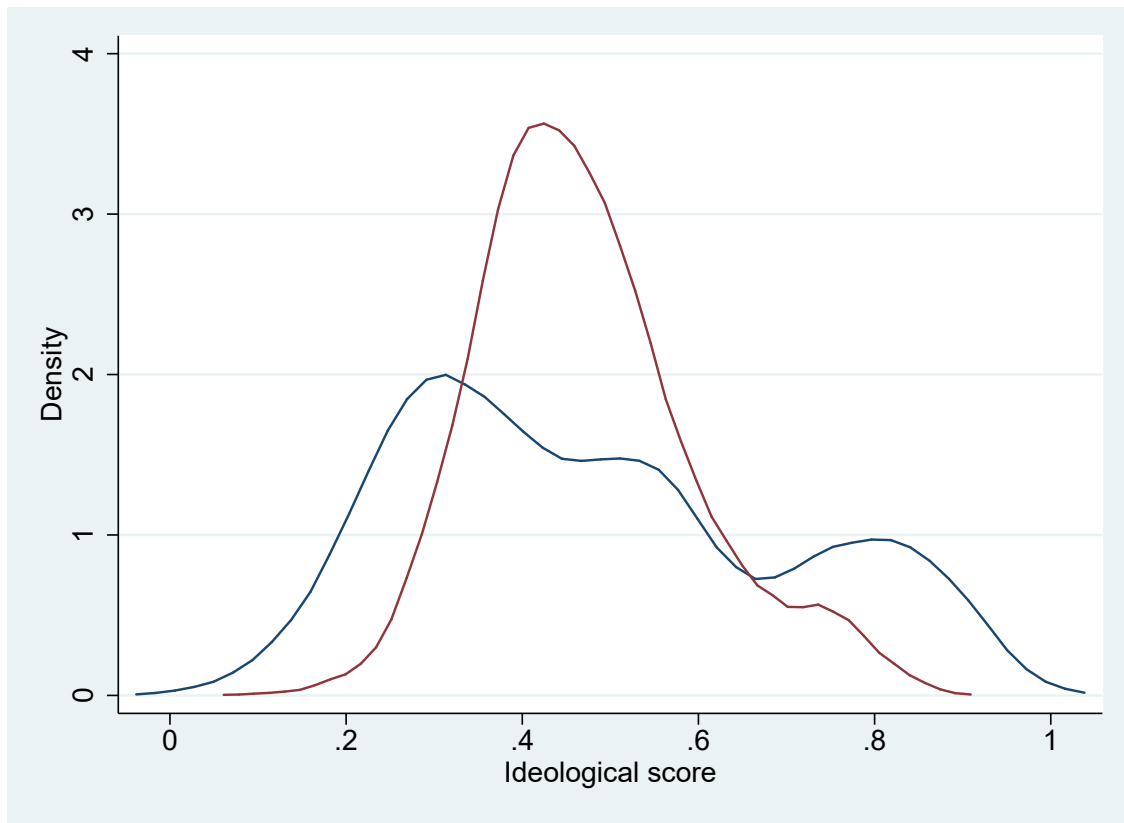
Overall, the I-732 experience highlights a strategic fork in the road for would-be crafters of a politically feasible carbon tax: a revenue-neutral policy that appeals to political moderates, or a tax-and-spend policy that appeals mainly to progressives. California has found some success with the latter approach. Will either approach prove successful in other states or at the national level? This remains to be seen.

References

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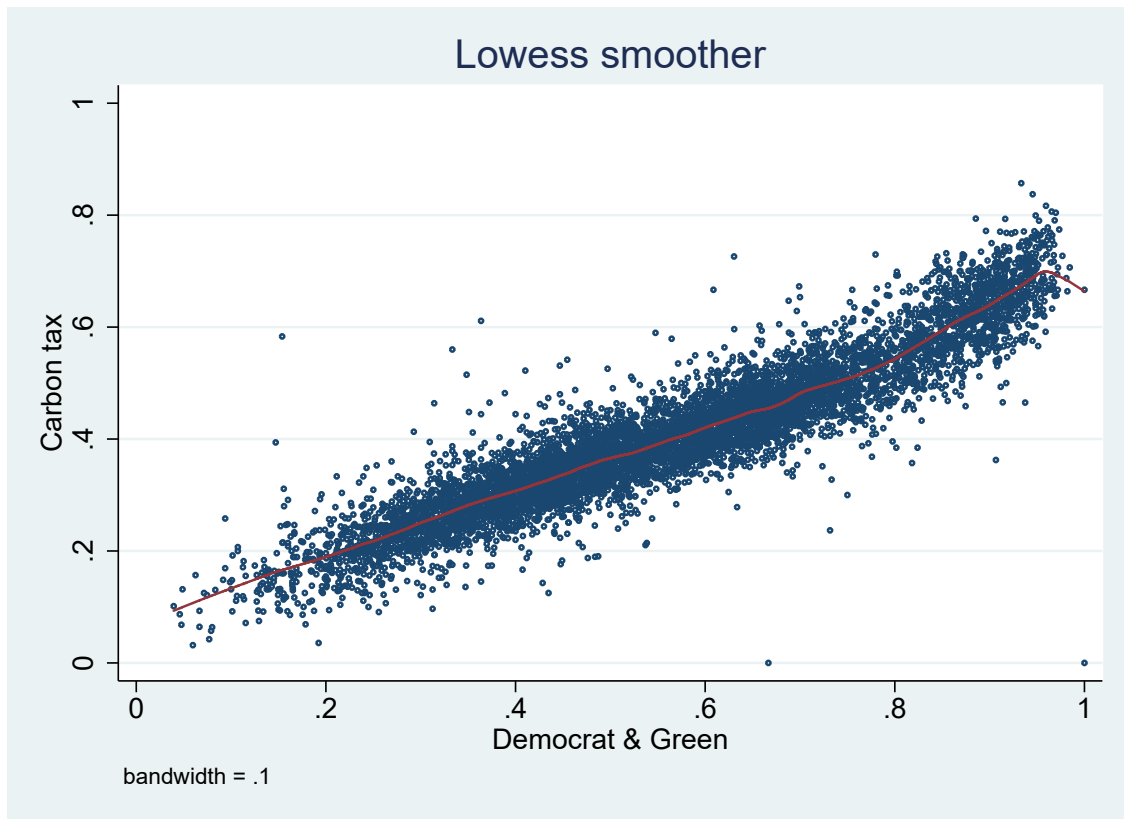
A Appendix

Figure 5: Joint distribution of first two ideological components



Note: This figure shows the distribution of ideological component #1 (i.e., the first component of a principal component decomposition of voting on statewide ballot initiatives *other* than I-732 for precincts with a value for ideological component #2 (i.e., the second principal component) below the median (blue) and above the median (red). See text for details.

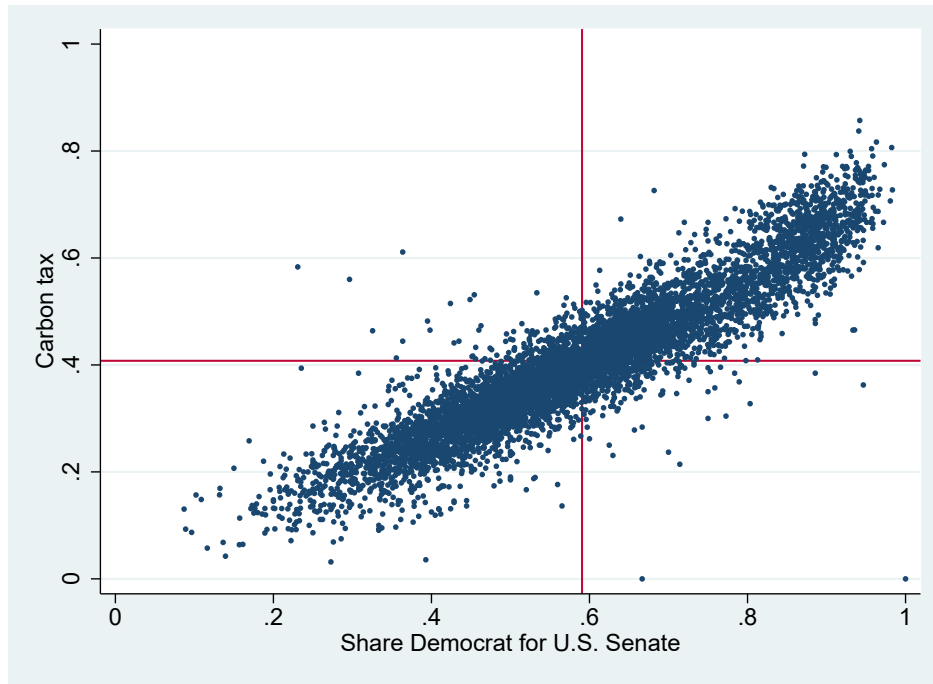
Figure 6: Precinct-level on I-732 vs. statewide elections (LOWESS)



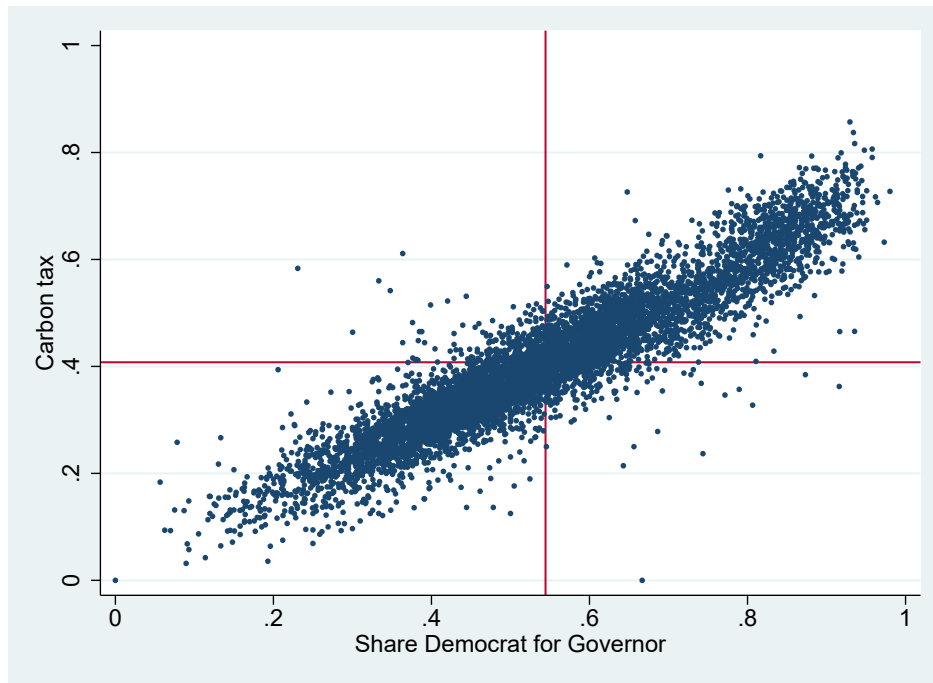
Note: This figure plots a local linear regression for the “yes” vote share for I-732 regressed on the presidential vote. See text for details.

Figure 7: Precinct-level vote on I-732 vs. statewide elections

(a) U.S. Senator

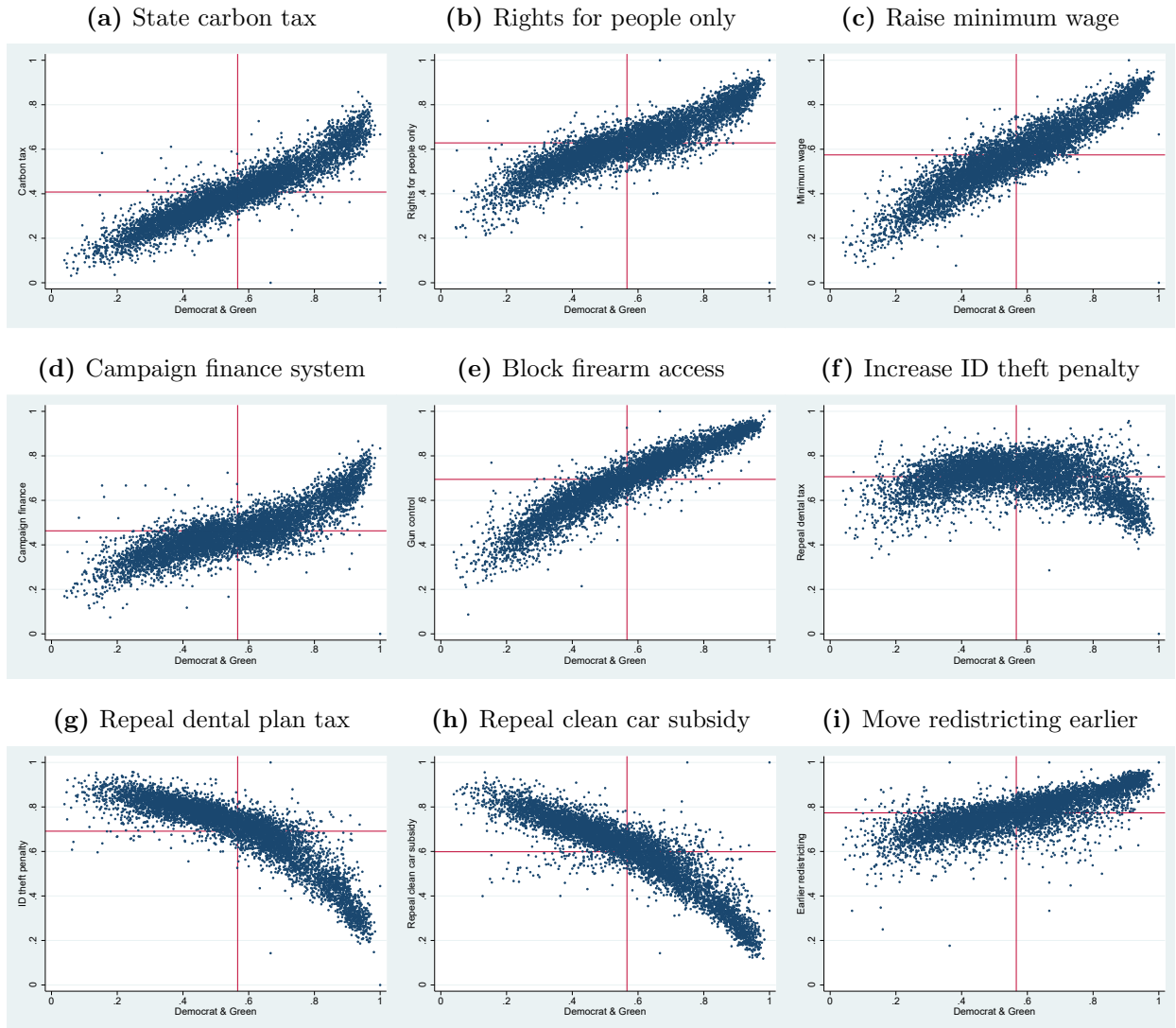


(b) Governor



Note: This figure plots the “yes” vote share for I-732 versus the Democratic (versus Republican) vote share on the November 2016 election for U.S. Senator and governor. See text for details.

Figure 8: Precinct-level vote on all November 2016 ballot measures



Note: This figure plots “yes” vote shares on the state carbon tax (I-732) and other statewide ballot measures versus the presidential vote shares. See text for details.