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Changing prices in a changing climate: Electoral competitiveness and fossil fuel taxation*

Jared J. Finnegan+

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Abstract: For over 40 years, economists have advocated carbon taxes as the most efficient policy for addressing climate change. However, not all governments have increased the price of fossil fuels. When do politicians decide to increase consumer prices? This paper highlights the role of electoral competitiveness. I argue that carbon tax increases are most likely when competitiveness is low and politicians are insulated from voter punishment. Moreover, this effect depends on the personal costs that tax increases impose on voters. If a good is not widely consumed, politicians can tax it more easily, even when competition is high. I test this explanation using a unique dataset on gasoline taxes and new data on electoral competitiveness across high-income democracies be-tween 1978 and 2013. The results are consistent with the theory. In addition, a case study of eco-tax reform in Germany across two sequential electoral periods demonstrates how changes in the electoral fortunes of the Social Democratic-Green coalition generated changes in fossil fuel tax policy. This analysis points to a crucial mechanism that plausibly accounts for the differential ability of governments to tackle a wider range of long-term policy challenges.

Keywords: Fossil fuel tax, carbon tax, electoral competitiveness, political economy, climate change

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1. Introduction

For over 40 years, economists have advocated carbon taxes as the most efficient policy for combatting climate change (Nordhaus 1977). By increasing their price, taxes should reduce the consumption of carbon-intensive goods and services and therefore reduce carbon dioxide (CO2) emissions. However, by some estimates 85% of global greenhouse gas emissions remain unpriced (High-Level Commission on Carbon Prices 2017). The OECD recently found that only 10% of emissions are priced at or above 30 Euros per tonne – the lower-end estimate needed to meet the objectives of the Paris Agreement (OECD 2016). Why have governments been so reluctant to increase the price of fossil fuels? Surprisingly, we know very little about the politics of such policy decisions. Indeed, political science has been virtually silent on this question, which is especially alarming given the importance of climate change as a policy problem (Keohane 2015).

This paper examines the influence of one factor: electoral competitiveness. A key characteristic of carbon taxation is its temporal structure. Costs are imposed in the short-term in order to generate future benefits. Research on the politics of long-term policymaking and structural change suggests that a necessary condition for such policies is electoral safety (Garrett 1993; Jacobs 2011). It is only governments that have a low risk of losing office that can assume the long-term time horizon needed to engage in policy-induced structural change, such as decarbonizing the economy. Indeed, the nascent comparative climate politics literature suggests that electoral incentives play a key role in policy outcomes, however a direct theoretical and empirical link between fossil fuel taxation and electoral competitiveness has yet to be made (Aklin and Urpelainen 2013; Harrison and Sundstrom 2010, Ch 1; Rabe 2010). Though separate literatures in American politics, comparative political economy and economics suggest a link between link between electoral competition and tax policy (Berry and Berry 1992; Besley et al. 2010; Rogowski and Kayser 2002).

This paper extends these insights to offer a novel theoretical account of the relationship between electoral incentives and fossil fuel taxation, specifying the electoral conditions under which tax increases are most likely. It argues that increases are likely when competitiveness is low and politicians are insulated from voter punishment. When electoral competitiveness is high, however, politicians face greater incentives to respond to voters' tax preferences. I argue that a key heuristic used by politicians to gauge such preferences will be the short-term personal costs that tax increases impose on voters. Fossil fuel tax increases that generate few personal costs, for example because fuel consumption is low, should be less politically risky at any level of electoral competitiveness. However, tax increases that generate high personal costs engender political risk. As costs rise, stiff electoral competition should sharply reduce incentives to raise rates.

I test these arguments by analyzing the taxation of one widely consumed and important fossil fuel: gasoline. Using a unique dataset of gasoline excise tax rates and new data on electoral competitiveness, I examine the relationship between competitiveness and taxation across twenty advanced democracies between 1978 and 2013. A consistent picture emerges. High levels of electoral competitiveness are associated with low gasoline tax rates, controlling for country and year fixed effects and a host of potential confounders. Furthermore, the negative effect of competitiveness increases with personal costs. Using lagged gasoline consumption as a proxy for personal costs, I find that electoral competitiveness has little effect when costs are low. However, as consumption rises, the marginal negative effect of competitiveness increases. Put simply, governments increase fossil fuel taxes when electoral competition is low and when voters consume less of the taxed fuel. However, as competition and consumption rise, governments are less likely to adopt tax increases. To provide an illustration of how electoral competitiveness affects fossil fuel tax rates I undertake a case study of eco-tax reform in Germany across two sequential electoral periods from 1998 to 2005. I demonstrate how changes in the electoral fortunes of the Social Democratic-Green (Red-Green) coalition after the 2002 election generated changes in fossil fuel tax policy.

In addition to elucidating the political economy of fossil fuel taxation, the results offer a number of additional implications. First, they suggest a long-run positive feedback effect between electoral competitiveness, fossil fuel consumption and fossil fuel taxation. Lower taxes mean lower prices, which in turn encourage higher consumption, and vice versa. Higher consumption should make it more difficult for politicians to increase tax rates in the future, even at low levels of competitiveness. This effect should be present in the case of any good that is widely consumed by voters. In the case of fossil fuels, it should generate strong path dependencies over time that push countries onto different fossil fuel consumption and taxation trajectories. For those caught in a "high consumption-low tax trap", changing trajectories will likely prove difficult, especially in times of heightened electoral competition. Secondly, the results imply a two-way causal relationship between tax rates and consumption. Standard economic theory predicts that tax rates affect consumption, however the evidence here demonstrates that consumption also affects the tax rate by shaping politicians' perceptions of voter preferences.

This paper contributes to the academic and policy literatures in several ways. First, by developing a theory of fossil fuel taxation based on electoral incentives it contributes to the nascent literature on the comparative political economy of climate change policy (Harrison 2015; Hughes and Urpelainen 2015; Lipscy 2018; Mildenberger 2018; Tobin 2017) – an under-researched area (Cao et al. 2014; Keohane 2015; Purdon 2015). Secondly, it contributes to the recent literature on long-term policymaking and the policy effects of electoral competitiveness (e.g., Abou-Chadi and

Orlowski 2016; Immergut and Abou-Chadi 2014; Jacobs 2011). Lastly, it provides a general theoretical framework that specifies the electoral conditions under which increases in consumption taxes are politically feasible, thereby providing a more complete explanation of the political economy of increasing consumer prices through taxation (Rogowski and Kayser 2002; Chang et al. 2010). I focus on carbon taxes, but the argument is applicable to any long-term policy problem that requires short-term changes in consumer prices. From a policy perspective the paper has practical implications for addressing climate change. Increased fossil fuel prices are needed to shift production and consumption onto a more sustainable path. However, in democracies such a policy will likely face strong political headwinds if elections are highly competitive and fossil fuel consumption is diffuse. Policymakers should take these electoral incentives into account when designing and implementing carbon taxes.

2. The challenge of fossil fuel taxation

A tax on fossil fuels (e.g., gasoline, diesel, natural gas, coal and other petroleum products), or "carbon tax", is consistently advocated by environmental economists as the most cost-effective policy to reduce CO_2 emissions (Nordhaus 1977, 2008; Weitzman 2014). By increasing the price of fossil fuels, taxes should reduce their consumption, and by doing so, reduce emissions.[1] In the case of the transport sector, fossil fuel taxes are arguably "the single most powerful climate policy instrument adopted to date" (Sterner 2007, 3194). Without them, fuel demand and its associated CO_2 emissions would be much higher.

Governments have a number of policy design options when increasing taxes on fossil fuels (Sumner et al. 2011). They may adopt an explicit "carbon tax" – a flat tax based on the carbon content of the fuel; an energy tax – a flat tax based on the energy content of the fuel; an "environmental" or "eco-tax" – an excise tax by a different name; or simply increase existing excise or value-added tax (VAT) rates.[2] In addition, they may impose the tax directly on fuel consumed by households (downstream) or industry (upstream).[3] That is, on voters or business or both.[4] For the purposes of this paper, I use fossil fuel and carbon taxes to mean any direct tax on fossil fuels, regardless of name. It therefore includes all of the design options described above. Lastly, I focus

[1] A number of studies have found that carbon taxes are indeed effective in reducing emissions (e.g., Andersson 2017; Davis and Kilian 2011).

[2] Governments can also use emissions trading schemes to put a price on carbon, however in this paper I focus only on taxes.

[3] Taxes may also be imposed on fossil fuels produced by industry.

[4] Here I am describing only policy design and therefore leave out a discussion of tax incidence.

exclusively on taxes that are directly imposed on voters, leaving aside an analysis of industrial tax rate changes.

The challenges for politicians of effectively responding to climate change, by increasing fossil fuel taxes for example, are well-known. A stable climate is a global public good *par excellence*, which reduces the incentives of any one country to provide it, there is uncertainty about the scale and timing of future impacts and policy responses engender intertemporal and cross-sectional distributive consequences (Levin et al. 2012; Hovi et al. 2009; Bernauer 2013). However, despite these challenges, many governments *have* adopted climate policy over the past 30 years, including increased fossil fuel taxation. What explains this variation? Surprisingly, we lack general theory about the politics of such policy decisions (Cao et al. 2014; Purdon 2015).

A rich qualitative literature has examined fossil fuel taxation in single cases or regions: including Scandinavia (Daugbjerg and Pedersen 2004; Kasa 2000), Germany (Beuermann and Santarius 2006), the UK (Pearce 2006), Ireland (Convery et al. 2014), and British Columbia (Harrison 2012). In addition, a related set of studies have focused on the failures of fossil fuel taxation in the US (Erlandson 1994), France (Deroubaix and Lévèque 2006), and Australia (Bailey et al. 2012). While this work offers important descriptions of carbon tax politics in particular instances, it lacks general theorizing about the conditions under which politicians are likely to increase tax rates. For this reason, the literature has yet to identify or test a common set of key political variables that should affect politicians' strategic calculations regarding carbon taxation. For example, a number of studies suggest that electoral incentives play a key role in structuring politicians' decision-making (Kasa 2000; Pearce 2006; Harrison 2012). However, none have identified specific incentives or demonstrated their empirical relationship to particular policy outcomes. For example, Rabe (2010) argues that carbon taxes have failed in the US because there is considerable aversion among politicians to directly impose costs on voters. However, he does not explain the source of this incentive nor can his explanation of the US account for carbon taxes in other similar democracies. Only very recently have scholars began to identify and test the role of electoral incentives (Lipscy 2018). This paper seeks to contribute to this effort by developing a novel theoretical account that explains the relationship between electoral incentives and fossil fuel taxation. In particular, it focuses on the role of electoral competitiveness in structuring politicians' preferences for imposing short-term costs on voters.

3. Electoral competitiveness and fossil fuel taxation: A theoretical framework

In democratic settings, the governing party competes with one or more other parties to win a plurality of seats at the next election.[5] The governing party has vote-, office-, and policy-seeking preferences (Strom 1990). The ordering of these preferences depends on the competitiveness of the electoral environment (described further below). Under these constraints, the party considers a policy that will increase the household tax rate on one or more fossil fuels. A key feature of the policy is that it constitutes an intertemporal distribution of resources (Jacobs 2011). That is, the tax increase is a long-term "policy investment" that imposes short-term costs on voters in order to generate future public goods. Such goods can include, for example: mitigated climate change, energy security and/or improved infrastructure (as a result of using revenues to repair roads and bridges). The crucial point is that, from the perspective of voters, the goods arrive at some point in the future and are therefore not temporally aligned with the costs.

The reasons why the governing party prefers increased fossil fuel taxation will vary. Parties may be motivated by ideology, partisanship, or revenue maximization.[6] However, a preference is a necessary but not sufficient condition for policy change. Simply because the governing party prefers to increase fossil fuel taxes does not mean that it will propose such a policy or indeed succeed. Given the typically diffuse consumption of fossil fuels amongst voters, I assume that the governing party will view directly increasing their price via taxes to entail some political risk, since they will expect that price increases will enjoy some level of unpopularity amongst voters. Survey research in environmental psychology supports this assumption (Drews and Bergh 2015). Individuals' support for environmental policy decreases as the personal costs of the policy rise. Moreover, evidence suggests that voters tend to punish politicians at the next election for tax increases (Kone and Winters 1993; Niemi et al. 1995).

Governing parties that prefer to increase fossil fuel taxes will therefore require a *political opportunity* (Berry and Berry 1992; Karapin 2016). These will be moments when the party is shielded from the political costs of such increases.[7] Evidence suggests that political opportunities exist just

[5] In the case of coalition governments, I refer to the prime minister's party as the governing party. This party is typically also the largest party in the coalition.
[6] While it is not the purpose of this paper to disentangle government preferences for taxation, there is a large Public Choice literature that seeks to do so. For a review see Solé-Ollé (2006).
[7] I assume that marginal political costs are equal to the marginal loss of votes at the next election (Hettich and Winer 1988).

after a government wins election, when it has political capital to spend.[8] Studies find that opportunities also exist in times of inflation (when prices are rising across the economy), when the price of oil is dropping, and in times of fiscal stress (Berry and Berry 1994; Geschwind 2017; Goel and Nelson 1999).

Electoral competitiveness should also play a key role in structuring political opportunities for increasing fossil fuel tax rates. Electoral competitiveness is the expected probability of a change in government control at the next election as perceived by the governing party (Boyne 1998, 212; Kayser and Lindstädt 2015, 243). Put simply, the more uncertain the governing party expects an upcoming election to be, the more competitive it is (Strom 1989, 281). Competitiveness matters because it structures the governing party's tradeoff between vote-seeking strategies on the one hand and policy-seeking ones on the other (Strom 1990).

When electoral competitiveness is low, the governing party has a low probability of losing power at the next election. They enjoy an electoral advantage because they possesses a surplus of committed voters, which they believe can be relied upon to vote in their favour even if fossil fuel taxes are increased.[9] This insulates the party against marginal losses in vote shares that may result from a backlash of some committed voters, and by doing so generates a political opportunity for policies that may otherwise be unpopular.[10] Specifically, these electoral conditions should push myopic vote-seeking strategies down the party's preference ordering, which in turn should enable it to contemplate and adopt long-term climate policy investments that impose short-term costs on constituents (Garrett 1993; Jacobs 2011). Hence, it is in these moments that the party should be most likely to increase fossil fuels taxes, all else equal.

Conversely, when competitiveness is high, the outcome of the upcoming election is uncertain. Here the party's vote-seeking preferences should dominate and push it to pursue a short-term strategy of vote-maximization in an effort to win the next contest.[11] Assuming that the party perceives tax increases to be electorally risky, they should be unlikely to increase them for fear of

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[8] Building on Nordhaus (1975), there is a large literature on electoral cycles and the timing of tax increases. For examples see Mikesell (1978), Royed and Borrelli (1999) and Nelson (2000).

[9] I assume that these voters are committed to the party for primarily non-climate change-related reasons, such as economic reasons.

[10] Indeed, in times of low electoral competitiveness governing parties have been found to adopt otherwise unpopular policies, such as liberal immigration reform (Abou-Chadi 2016), fiscal consolidation (Hübscher and Sattler 2017), welfare state retrenchment (Immergut and Abou-Chadi 2014), business and property taxes (Solé Ollé 2003), "rent-seeking" policies (Besley et al. 2010), and policies that increase consumer prices (Rogowski and Kayser 2002).

[11] Competitiveness may increase for a number of reasons. For example, when there is a decline in committed voters, which increases voter volatility as the proportion of voters that are open to party persuasion increases (Strom 1989, 281).

losing marginal votes, all else equal. Hence, electoral competitiveness should have an overall negative effect on fossil fuel taxation.

However, the assumption that tax increases will always be politically risky can be relaxed. Doing so enables us to theorize how the governing party's perceptions of political risk moderate the relationship between competitiveness and taxation. One factor that should guide party's calculation of risk is their perception of voters' carbon tax preferences. At high levels of competitiveness, the party should be more responsive to the preferences of the electorate since such a strategy should improve its chances of winning (Hobolt and Klemmensen 2008; Strom 1989).[12] How will the governing party perceive such preferences? Informational asymmetries exist between politicians and voters making it nearly impossible for the governing party to be entirely certain about what voters want. We should therefore expect that they rely on heuristics.

One important heuristic should be costs. Similar to other taxes, voter preferences toward fossil fuel taxes should be shaped by the costs and benefits to them of such taxes (Hettich and Winer 1988). As mentioned, the crucial problem for the governing party is that, like other long-term policy investments, the costs and benefits of increased carbon taxation are not temporally aligned for voters. The costs are felt immediately in the short-term, while the primary benefits (in particular a stable climate) are gained over the long- to very-long term.[13] Voters may value these future benefits, but at a discount rate that is likely to be high (Frederick et al. 2002; Jacobs and Matthews 2012). Moreover, short-term costs imposed on households via direct taxation are highly visible, and as a consequence are likely to enjoy high political salience amongst voters (Gamage and Shanske 2011).

The governing party should therefore expect that voter preferences for fossil fuel taxes depend primarily on the average short-term individual cost, or *personal cost*, that such taxes generate. For example, they should know SUV drivers are unlikely to prefer an increase in the gasoline tax rate, while cyclists are likely to be indifferent or even supportive. This reasoning is also consistent with survey research in environmental psychology mentioned above. Furthermore, it is consistent with the logic of cost-benefit analysis, which describes costs in terms of average short-term costs

[12] In the classic Downsian setup, the governing party should be more responsive to the preferences of the median voter.

[13] To be sure, voters may also enjoy immediate benefits from increased fossil fuel taxation, including: co-benefits such as reduced air pollution and/or increased spending on public goods (e.g., if revenues are used to increase social policy funding) or to lower taxes on other goods (such as income via environmental tax reform, see Andersen and Ekins 2009). However, these benefits will tend to be ancillary to the primary aim of increased fossil fuel taxation, which is to combat climate change.

Table 1. Two-by-two of interaction effect

	Perception of low personal costs	Perception of high personal costs
Low electoral competitiveness	• Least political risk (Most likely to increase carbon tax rate)	• More political risk
High electoral competitiveness	• Less political risk	• Most political risk (Least likely to increase carbon tax rate)

to households and is typically used by governments to evaluate the distributional effects, and political feasibility, of carbon taxes.

The negative effect of electoral competitiveness on fossil fuel taxation should therefore be different at different levels of personal cost (see Table 1). When the governing party perceives the personal costs of a tax increase to be low, there should be less political risk in adopting it, even at high levels of competitiveness; because the party should expect voters to be relatively indifferent about rate changes. Put simply, it should be politically safe to increase taxes if such increases don't cost voters anything. However, as personal costs rise, the governing party should expect that voter preferences are tilted against an increase in the tax rate. High personal costs coupled with high electoral competitiveness should generate strong incentives for the governing party to not increase rates or even reduce them.

4. Empirical analysis

4.1. Research design

To test these arguments I examine the relationship between levels of electoral competitiveness and gasoline taxation within 20 advanced democracies between 1978 and 2013.[14] Gasoline is major source of carbon pollution across these countries. Emissions from transportation made up, on average, more than one quarter of their total CO_2 emissions over the period. For this reason, gasoline taxes are arguably the most important tax on carbon, and therefore climate policy, adopted

[14] The sample includes: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, New Zealand, Netherlands, Norway, Portugal, Spain, Sweden, UK, and USA.

to date (Sterner 2007). Furthermore, even though all gasoline taxes are not explicitly labelled "carbon taxes", all carbon taxes imply a tax on gasoline. Indeed, virtually every carbon tax adopted by high-income democracies to date is applied to gasoline.[15] In practical terms, gasoline is widely consumed by voters across the sample of countries and over time, which is not the case for other fossil fuels (e.g., natural gas or heating oil). Moreover, motorists frequently visit gasoline stations to fill up, making changes in gasoline prices highly visible to voters. For these reasons, gasoline represents a very good case for analyzing the political economy of directly taxing a fossil fuel that is consumed widely and frequently by voters.

Gasoline is typically taxed via two general instruments: excise taxes and *ad valorem*, or value-added, taxes (e.g., VAT). Because VAT rates vary little over time and not all countries have them, I analyze excise taxes.[16] Excise taxes on gasoline have been adopted by all countries in the sample and offer variation across space and time (Figure 1). To measure gasoline excise taxes I compile a unique dataset of excise tax levels per litre of regular gasoline in national currencies from a variety of national and international sources.[17] In addition to standard excise taxes, the measure also includes any explicit carbon taxes or other special environmental taxes that are applied to gasoline.

Across the sample period, governments tended to either not change tax rates (47% of country-years) or increase them (46%) (Table 2). Very rarely are they decreased (7%). However, there is wide variation by country. In the US the tax rate has been increased in only three years since 1978, whereas in Sweden and the UK it was increased in 25 of 36 years.

Table 2. Changes in gasoline tax rates across high-income democracies (1978-2013)

Gasoline excise tax rate change:	Freq.	%
Decrease	41	6.89
No change	281	47.23
Increase	273	45.88
Total	595	100

4.2. Operationalizing key variables

A valid measure of gasoline taxation needs to capture the timing and magnitude of tax rate changes. Furthermore, it needs to be a policy variable that politicians have direct control over. Using rates

[15] To my knowledge the only exception is the UK's Climate Change Levy.
[16] However, I control for VAT rates in the empirical analysis.
[17] Depending on the country, regular household gasoline is either RON 91 or RON 95. See Appendix A.2 for data sources.

in nominal national currencies is the most precise measure, however it is not cross-nationally comparable. Unfortunately, no cross-nationally comparable measure can precisely capture both timing and magnitude. For this reason, I develop two dependent variables to test my arguments.

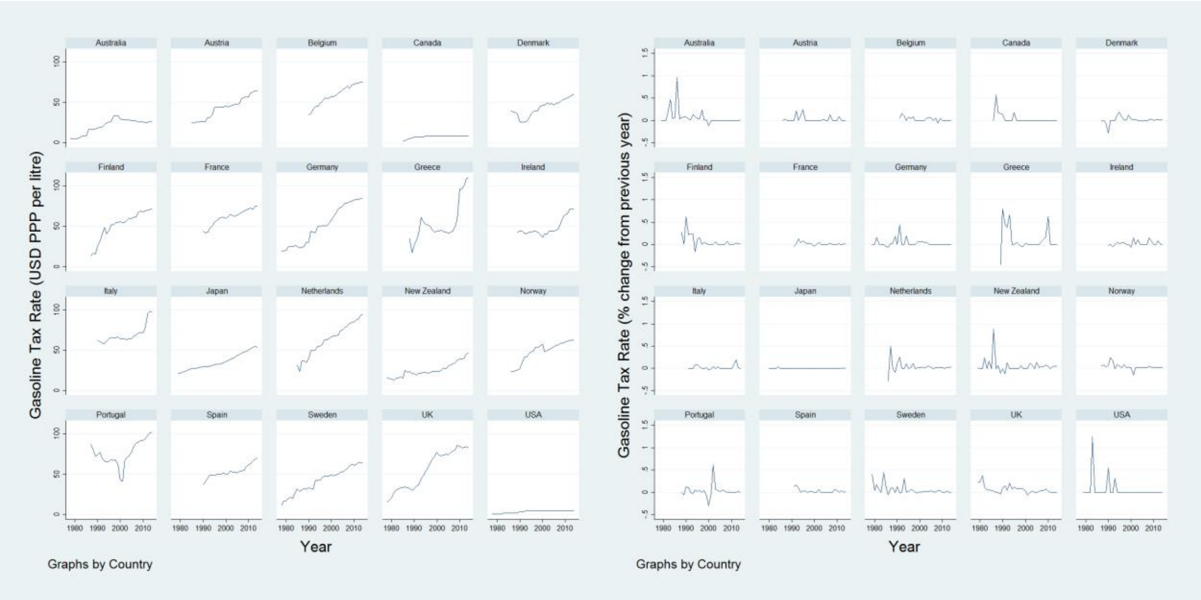
The first measures the level of the tax rate by converting national currency rates into a common unit – nominal US dollars, using USD purchasing power parity exchange rates (Figure 1 – left side). The benefit is that the measure captures tax levels in a comparable way over time. The downside is that some artificial variation is introduced as a result of exchange rate fluctuations, which are independent of tax decisions by politicians. To minimize this potential measurement error I include a range of macroeconomic controls that affect exchange rates, including: inflation, public debt, and economic growth.

The second dependent variable measures annual percent changes in tax rates. To do this, I divide the first difference of the national currency tax rate by the rate in the previous year (Δtax $rate_{i,t}$ / tax $rate_{i,t-1}$) (Figure 1 – right side). This measure can be thought of as the growth rate of gasoline taxation. The benefit is that it precisely captures changes in rates and therefore political decision-making. The downside is that it does not fully capture the magnitude of those changes. Percent changes are higher for countries with low rates in the previous year and lower for countries with high rates. For example, in 1983 the US increased the tax rate from 1.0567 cents per litre to 2.378, a change of 125%. While in 2010, the UK increased its rate from 56 to 58 pence, a change of 3.6%. To address this I include a lag of the tax rate level (from above), which controls for the past levels of taxation from which changes are made.

I calculate both dependent variables based on nominal rather than real rates. As mentioned, the measure needs to capture the behavior of politicians, since this is the phenomenon that my arguments seek to explain. Therefore, the variables need to be policy variables that politicians have direct control over. Indeed, politicians *only* have direct control over the nominal rate. Moreover, it is nominal increases in tax rates that will most likely be politicized during election campaigns. Methodologically, it is also useful to use nominal rates. This way inflation can be included in the model as a separate independent variable, which enables the estimation of its independent influence on politicians' behavior. For these reasons, previous studies on gasoline taxation have also used nominal rates (Decker and Wohar 2006; Goel and Nelson 1999).

To measure electoral competitiveness I use new data on loss probability from Kayser and Lindstädt (2015). Their measure is appropriate to test my arguments since it captures the "expected probability that the plurality party in parliament loses its seats plurality in the next election" from the perspective of that party (Kayser and Lindstädt 2015, 243). It is a function of two elements: (1) the expected variability, or uncertainty, of a party's national vote share at the next election from

Figure 1. Gasoline taxation across high-income democracies



the perspective of politicians in that party, and (2) the way in which changes in national vote shares produce changes in legislative seat shares (i.e., the country's seats-votes elasticity), which depends on national electoral rules and the geographic distribution of each party's voters.

The measure is forward-looking and captures the view of the dominant policymaker regarding the electoral security of their position. Moreover, because loss probabilities are estimated from the first day after an election they enjoy exogeneity from policy-related dependent variables (in my case gasoline taxes). This data offers the most sophisticated measure for the countries in my sample. Additionally, it enables me to overcome data limitations that have previously prevented climate politics researchers from directly testing the effects of loss probability (e.g., Aklin and Urpelainen 2013).

Kayser and Lindstädt (2015) estimate loss probabilities for the plurality party in the legislature. While this party is typically also the governing party, in some cases it is not. Because I'm making arguments about the governing party, I drop 44 observations in which the plurality party in the legislature is not the prime minister's party. However, the results are robust to the full sample.[18] Because of missing data for both loss probability and tax rates, the panel is not perfectly balanced.

Electoral competitiveness is highest at middle values of loss probability. Therefore, the functional form between it and fossil fuel tax rates should be quadratic (i.e., U-shaped) (Kayser

[18] See Appendix A.4.

and Lindstädt 2015, 249). However, I also intend to estimate a linear model that interacts electoral competitiveness with personal cost. I therefore need to capture electoral competitiveness in a single variable. To do so, I transform loss probabilities into electoral competitiveness by measuring the absolute distance of each governing party's loss probability from 0.5, or theoretically perfect competition.[19] This new measure assumes that governing parties that have a low probability of losing at the next election (i.e., "likely winners" with a loss probability below 0.5) and those that have a high probability of doing so (i.e., "likely losers" with a loss probability above 0.5) will behave similarly. I test and validate this assumption in Appendix A.3.

A measure of politicians' perceptions of voters' personal costs presents a number of possibilities. The most reasonable and straightforward measure of costs is gasoline consumption per capita. The more the average voter consumes gasoline, the more a tax increase will cost her or him, all else equal. Consumption also captures voters' average transport technology choice. For example, a country where most people drive will have higher average consumption than one where most take public transport or cycle. In this way it can control for patterns of urbanization (i.e., urban-rural divide) and public transport infrastructure. To be sure, these changes will be endogenous to the tax rate. I therefore used lagged fuel consumption in the empirical analysis below. To measure fuel consumption, I calculate average gasoline consumption (litres per capita) using data on household gasoline consumption and population.[20] The results are also robust to using an alternative measure of personal cost: expenditure on gasoline as a percentage of household income.[21]

4.3. Controlling for potential confounders

I am interested in the effect of electoral competitiveness on gasoline taxes and therefore need to control for confounding variables that may also have an effect on the tax rate. I include two sets of controls. The first set controls for differences in tax policy preferences (i.e., policy-seeking preferences) across governing parties. To control for partisan effects I include two measures: percentage of cabinet seats held by green parties and percentage held by non-green left parties.[22] To control for differences in fiscal health, which may push governments to maximize tax revenues, I

[19] See Appendix A.3 for details. The approach is virtually identical to the one used in American politics to calculate the Ranney Index of electoral competition (e.g., Flavin and Shufeldt (2016)).

[20] Data on median gasoline consumption would be ideal, but it is unavailable for the sample of countries.

[21] See Appendix A.4.

[22] The evidence is mixed regarding the relationship between environmental policy and partisanship. Some suggest a link between left parties and environmental performance (Jahn 2016, Ch 7; Knill et al. 2010; Ward and Cao 2012; Tobin 2017), while others find no relationship (Aklin and Urpelainen 2013; Fankhauser et al. 2015; Neumayer 2003). Similarly, some find that green parties increase environmental policy adoption

include measures of the budget deficit and public debt (Berry and Berry 1992, 1994). To control for the influence that oil companies may exert on governments, I include a measure of domestic oil production. Lastly, I include a dummy for ratification of the Kyoto Protocol, since this may have compelled otherwise reluctant governments to increase taxation in order to comply with international climate-related agreements.

The second set of controls includes factors that may influence political opportunities for tax rate increases. That is, variables other than electoral competitiveness that could influence vote-seeking behavior. To control for the effect of electoral cycles I include a dummy for election years (Nordhaus 1975). I control for inflation, since times of inflation may provide cover to increase taxes or tax increases may be indexed to inflation (Berry and Berry 1992, 1994; Goel and Nelson 1999). I also include nominal GDP growth to control for national economic shocks that may affect voters' sensitivity to price increases (Berry and Berry 1992). I include VAT rates on gasoline to control for the level of taxation apart from excise taxes. Lastly, I control for the saliency of environmental issues across the political system. Regardless of partisanship, the governing party may find it less risky to increase fossil fuel tax rates in times when the environment is a salient political issue. To measure saliency I collect party-specific data on pro-environmental issue attention and then calculate the average across all parties in a given country-year.[23] This measure should also provide a proxy for green issue salience amongst voters, since issue attention amongst parties should reflect underlying voter preferences.[24]

Restricting the analysis in the first instance to these variables offers the most parsimonious and theoretically-motivated approach. However, the results are robust to the inclusion of a wide variety of additional controls, including: government ideology (e.g., left vs right and green vs growth), type of government (e.g., single-party vs coalition), political constraints (i.e., veto players), spending on social policy, GDP per capita, urbanization, income tax structure and EU membership.[25]

(Jahn 2016, Ch 7; Jensen and Spoon 2011), while others find no effect (Scruggs 1999). Lastly, findings from the economics literature on partisanship and taxation are also mixed. Ashworth et al. (2006) and Solé Ollé (2003) find that left governments are more likely to increase tax rates, while Caplan (2001) and Bordignon et al. (2003) find no partisan effect.

[23] I use the variable per501 from the Comparative Manifestos Project.

[24] Sources and summary statistics for all variables are provided in Appendix A.1.

[25] See Appendix A.4.

4.4. Model specification

The time-series cross-sectional (TSCS) structure of my data allows for the use of country and year fixed effects models. The primary advantage of this modelling strategy is that it enables me to rule out two threats to causal inference: time-invariant country-specific confounders (e.g., electoral rules and other time-invariant political institutions, as well as cross-national differences in culture that may influence attitudes toward taxation or the environment) and year-specific shocks that affect all countries equally (e.g., changes in the global price of oil, global economic shocks, international climate change negotiations, scientific knowledge about climate change, and growing public awareness about climate change). The remaining primary threat to causal inference is omitted variable bias that may result from the omission of a time-varying country-specific confounder. To minimize this threat I include a variety of controls (described above).

There is a lag between when gasoline tax rates are decided by politicians and when they are implemented. Typically excise taxes are set in the current year when drafting the annual budget for the upcoming year. That is, the tax rate in time *t* is a result of political decisions made in time *t-1*. Therefore, the assumption is that the tax rate in time *t* reflects information available to politicians in time *t-1*. To model this delay, I lag all variables one year (apart from the electoral cycle). This structure also attenuates potential endogeneity between gasoline consumption and the tax rate, since the tax rate in time *t* is unlikely to have a direct effect on gasoline consumption in time *t-1*. Given its theoretical foundation, this lag structure is the preferred approach. However, the results are robust to a two-year lag structure.[26]

I estimate two equations. The first analyzes tax rate levels:

$$y_{it} = \beta_1 x_{it-1} + \beta_2 z_{it-1} + \beta_3 x_{it-1} * z_{it-1} + \beta_4 \mu_{i,t} + \theta c_{i,t-1} + \alpha_i + v_t + e_{it} \quad (1)$$

where y_{it} is the nominal tax rate level (in USD PPP/litre) in country i in year t; x_{it-1} and z_{it-1} are key independent variables of interests lagged one year; $x_{it-1} * z_{it-1}$ is the quadratic or interaction term (depending on the model); $\mu_{i,t}$ is the electoral cycle; $c_{i,t-1}$ is a vector of lagged control variables; α_i are country fixed effects; v_t are year fixed effects and e_{it} is the error term.

The second equation analyzes changes in the tax rate:

$$\Delta y_{it} = \tau_1 \varphi_{it-1} + \beta_1 x_{it-1} + \beta_2 z_{it-1} + \beta_3 x_{it-1} * z_{it-1} + \beta_4 \mu_{i,t} + \theta c_{i,t-1} + \alpha_i + v_t + e_{it} \quad (2)$$

[26] See Appendix A.4.

where Δy_{it} is the percent change in the excise tax rate from the previous year (based on rates in national currencies) and φ_{it-1} is a lag of the nominal USD PPP tax rate to control for past taxation levels (all other variables are the same as Equation 1).

There are two types of problems that may arise when analyzing TSCS data. The first is that the errors terms may suffer from autocorrelation and/or heteroskedasticity. To correct for both I use robust standard errors clustered at the country level.[28] The second potential problem is nonstationarity. If both my dependent variables and key independent variables are heavily trended upward or downward, then they may be nonstationary. If so, an association between them may be spurious. An Im-Pesaran-Shin unit root test of loss probability, electoral competitiveness and the percent change in tax rates rejects the null hypothesis that all panels contain a unit root at the 1% level. In the case of tax rate levels, the evidence against the null is weaker and can only be rejected the 10% level. Since all dependent variables and key independent variables are not nonstationary, I proceed with the analysis. As a final check, I use jackknife resampling to investigate whether one country in the sample is driving the results.[29] I find no evidence of this.

As a robustness check I also estimate a logit model with country and year fixed effects. The dependent variable equals 1 if the tax rate is increased and 0 otherwise.[30] This setup assumes that all tax increases are equal, which in practice is not valid. However, it enables a very strict test of whether competitiveness decreases the probability of *any* tax increase. This alternative specification does not substantively alter the results.

5. Results

5.1. Loss probability and gasoline tax rates

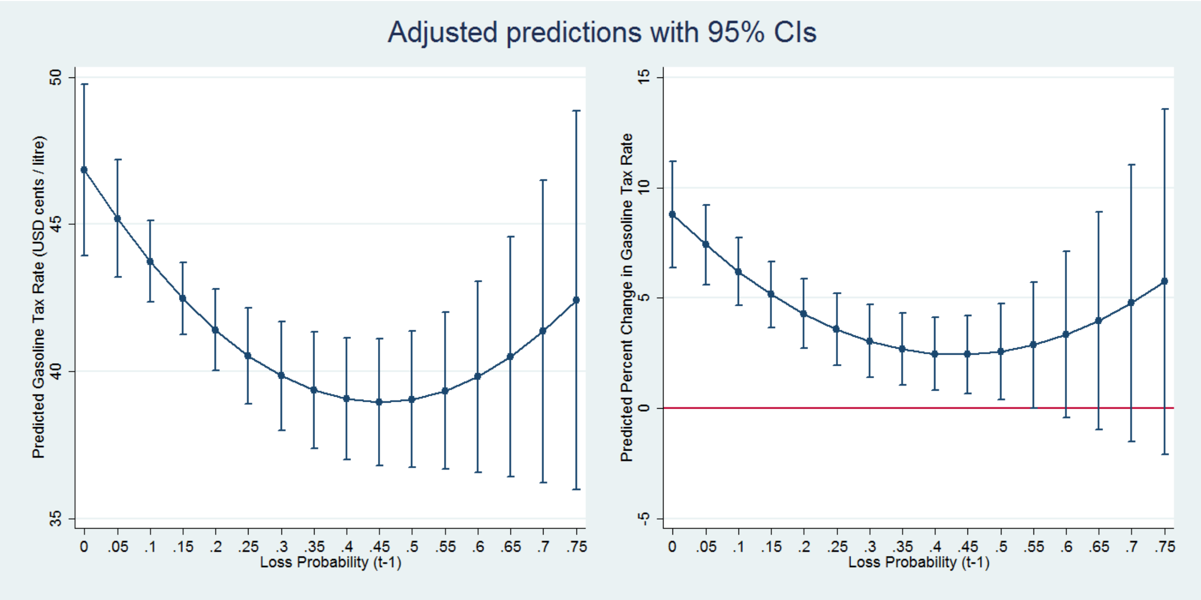
I first estimate the effect of loss probability on gasoline taxation. Electoral competitiveness should be highest around the middle values of loss probability and lowest at very high values and very low values. At these levels politicians should be less responsive to voters since modest changes in vote shares are unlikely to win or lose them seats in the next election (Kayser and Lindstädt 2015, 249).

[28] There is an ongoing debate in the literature regarding the number of units that is needed for valid inference when clustering standard errors, however there still no consensus on what that number is (see Cameron and Miller 2015, 341). Given the availability of data on loss probability, my sample is naturally fixed at 20 countries.

[29] See Appendix A.4.

[30] See Appendix A.4

Figure 2. Loss probability and gasoline taxation



To model this U-shaped relationship, I estimate quadratic fixed effects models that include loss probability and its square (Models 1 and 4 in Table 3). The coefficients have the correct signs and are significant. Plotting predicted tax levels and percent changes over different values of loss probabilities, holding all other variables at their means, enables easier interpretation (Figure 2). As expected, we observe a U-shaped relationship in the case of tax levels and changes. Both are predicted to be lowest at middle values of loss probability where electoral competitiveness is highest. Similarly, they are highest at very low levels of loss probability, where competitiveness is lowest. These findings support my theoretical arguments.

However, we also observe large confidence intervals at very high values of loss probability. The most likely reason is the distribution of the loss probability data.[32] There are very few observation above 0.6 and none above 0.754 (which is why the x-axis is scaled 0-0.75). Though I test and confirm that the behavior of "likely losers" and "likely winners" is not statistically different, it may be that be that the behavior of "likely losers" is more variable, and therefore less uniform than the behavior of "likely winners". The dearth of observations of governing parties with high loss probabilities prevents me from exploring this possibility. However, it should be an area for further research.

[32] The variable has a mean of 0.254 and a standard deviation of 0.218. See Appendix A.1.

5.2. Electoral competitiveness and tax rates

I next estimate the effect of electoral competitiveness on gasoline tax rates. To do so, I estimate fixed effects models and include my measure of electoral competitiveness (Models 2 and 5 in Table 3). This specification tests the linear relationship within countries over time between electoral competitiveness and tax rate levels and changes. The coefficients for electoral competitiveness have a negative sign and are significant. Competitiveness and gasoline tax rates are negatively correlated. Higher (lower) levels of electoral competitiveness are associated with: (1) lower (higher) levels of gasoline taxation and (2) lower (higher) annual percent changes in the tax rate, all else equal.

In the case of tax rate levels, a one-unit increase in electoral competitiveness is associated with a decrease in the tax rate of around 7.9 cents per litre the following year, all else equal (Model 2). However, since the range of electoral competitiveness is 0-1, a more sensible interpretation is to consider a one standard deviation increase (0.34), which is associated with a decrease of 2.67 cents per litre. In the case of changes, a one standard deviation increase in competitiveness decreases the annual growth rate of taxation by around 1.9 percentage points (Model 5). Put differently, countries' tax rates grow slower under high levels of competition.

These effects are substantively large. Consider the case of Sweden. It has the lowest average level of electoral competitiveness in the sample. Moreover, its carbon tax is the highest in the world and contributed to an average annual increase in the gasoline tax rate of 3% a year between 1991 (its year of adoption) and 2013. If electoral competition was to suddenly increase one standard deviation, we would expect the country to move onto a growth trajectory that is around 2 percentage points lower on average, all else equal.

5.3. Moderating effect of personal costs

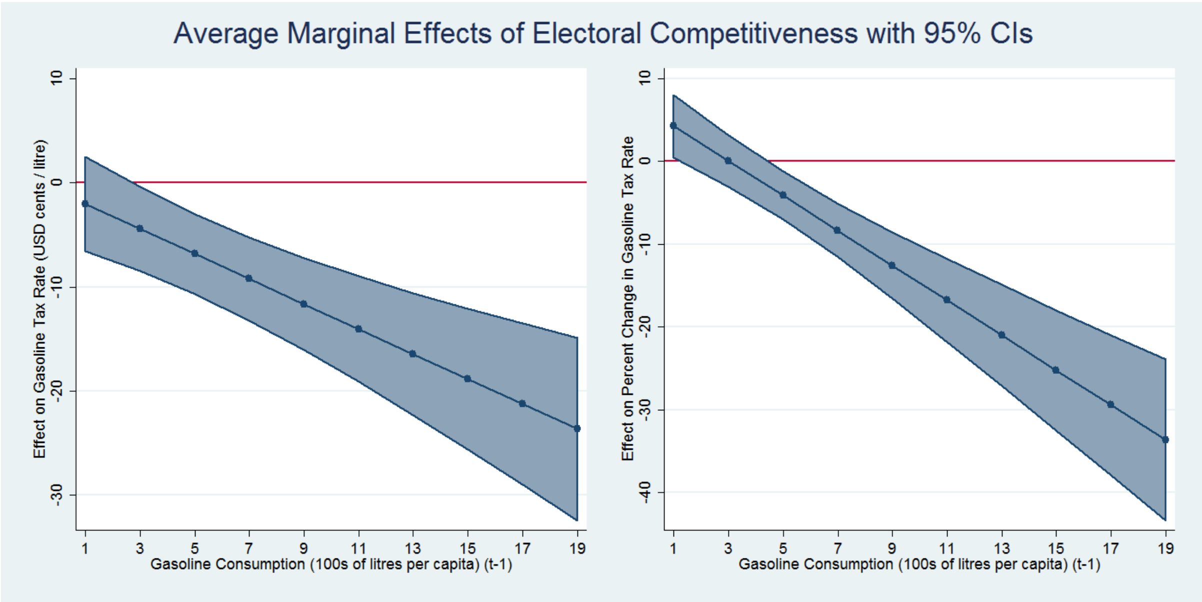
Models 3 and 6 are the interaction models. They test whether gasoline consumption (the proxy for personal costs) moderates the relationship between electoral competitiveness and the tax rate. The coefficients for the interaction terms are negative and significant. This indicates that the effect of electoral competitiveness on gasoline taxation is different at different levels of gasoline consumption, as predicted. Graphing the marginal effect of a one-unit increase in competitiveness at different levels of consumption, we see that as consumption increases the effect of electoral competitiveness also increases (Figure 3). For example, when consumption is 500 litres per capita (close to the average for the sample) a one standard deviation increase in competitiveness is associated

Table 3. Fixed effects models: Electoral competitiveness and gasoline taxation

	(1) Tax rate level (USD cents/litre)	(2) Tax rate level (USD cents/litre)	(3) Tax rate level (USD cents/litre)	(4) %Δ	(5) %Δ	(6) %Δ
Loss probability (t-1)	-34.99**			-29.16**		
	(12.40)			(10.47)		
Loss probability^2 (t-1)	38.77**			33.47*		
	(17.90)			(17.75)		
Electoral competitiveness (t-1)		-7.857***	-0.848		-5.576**	6.374***
		(2.383)	(2.486)		(2.510)	(2.165)
Gasoline consumption (t-1)			-1.617			1.088
			(1.235)			(1.260)
Electoral competitiveness * Gasoline consumption (t-1)			-1.199***			-2.107***
			(0.293)			(0.332)
Green cabinet seats (t-1)	0.212	0.225	0.198	0.0414	0.0492	-0.00130
	(0.185)	(0.193)	(0.179)	(0.241)	(0.238)	(0.242)
Left cabinet seats (t-1)	0.0437**	0.0436*	0.0357*	0.0231	0.0220	0.0215
	(0.0209)	(0.0208)	(0.0194)	(0.0318)	(0.0325)	(0.0324)
Environmental saliency (t-1)	-0.110	-0.110	-0.0306	-0.166	-0.165	-0.142
	(0.319)	(0.321)	(0.303)	(0.272)	(0.267)	(0.268)
Kyoto Protocol (t-1)	14.11***	13.14***	9.167***	12.66***	11.81***	7.601*
	(3.658)	(3.491)	(2.405)	(3.563)	(2.973)	(4.294)
Election year	-1.113***	-1.068***	-1.004***	-2.444*	-2.399*	-2.406*
	(0.359)	(0.361)	(0.344)	(1.318)	(1.345)	(1.343)
Budget deficit (t-1)	0.240	0.250	0.285	0.604**	0.615**	0.642**
	(0.216)	(0.216)	(0.197)	(0.267)	(0.266)	(0.260)
Government debt (t-1)	0.143*	0.135*	0.107	0.0274	0.0193	0.0372
	(0.0735)	(0.0712)	(0.0646)	(0.0548)	(0.0497)	(0.0604)
Inflation (t-1)	1.175**	1.177**	1.085**	1.458**	1.446**	1.550**
	(0.418)	(0.423)	(0.402)	(0.537)	(0.532)	(0.562)
Oil production (t-1)	0.919***	0.922***	0.835***	0.727**	0.719**	0.624**
	(0.214)	(0.201)	(0.169)	(0.299)	(0.302)	(0.267)
GDP growth rate (t-1)	-0.529**	-0.511**	-0.550**	-0.0462	-0.0302	-0.00969
	(0.222)	(0.222)	(0.209)	(0.342)	(0.343)	(0.337)
VAT rate (t-1)	0.278	0.300*	0.173	0.211	0.227	0.102
	(0.167)	(0.167)	(0.163)	(0.187)	(0.182)	(0.178)
Tax level (t-1)				-0.571***	-0.565***	-0.620***
				(0.132)	(0.130)	(0.134)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2 - within	0.796	0.795	0.809	0.281	0.278	0.299
R^2 - between	0.329	0.324	0.674	0.058	0.071	0.082
R^2 - overall	0.462	0.460	0.724	0.132	0.135	0.140
Countries	20	20	20	20	20	20
N	426	426	426	418	418	418

Notes: Robust standard errors in parentheses clustered at the country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 3. Marginal effects of electoral competitiveness



with a decrease in the tax rate level of 2.33 cents per litre and a decrease of the tax growth rate of 1.41 percentage points, all else equal. But as per capita consumption doubles to 1,000 litres, the same increase is now associated with a decrease of 4.37 cents per litre and 5 percentage points, all else equal.

We also see that electoral competitiveness has no marginal effect on the tax rate at very low levels of fuel consumption (i.e., at or below around 300 litres per capita). This supports the argument that when the personal costs of a tax increase are low, electoral competitiveness is unlikely to affect politicians' decision-making, since increases in tax rates on goods that are not widely consumed are less likely to lose votes. Indeed, in a world where no voter consumes fossil fuels putting up fossil fuel tax rates would involve little political risk. Taken together, these results provide strong support for the hypotheses that electoral competitiveness reduces electoral incentives to increase fossil fuel tax rates and that government perceptions of personal costs to voters moderate the relationship between electoral competitiveness and tax rates.

In addition, they offer two important implications. The first is a two-way causal relationship between consumption of the taxed good and the tax rate. Standard economy theory predicts that tax rates affect consumption, however the results here demonstrate how consumption affects the tax rate. Empirical research in economics has found a similar relationship between the number of smokers and the tobacco tax rate in US states (Hunter and Nelson 1992) and gasoline consumption and gasoline tax rates across OECD countries (Hammar et al. 2004). The hypothesis is that "sin tax" policy may be influenced by the size of the group subject to the tax. However, no detailed theoretical account has been provided. My argument offers such an account. Consumption of a taxed good shapes politicians' perceptions of voter preferences. When it is high, the governing party is reluctant to increase rates, especially when the next election is expected to be close. Hence, it is the behavior of vote-maximizing politicians that moderates the relationship between consumption and the tax rate.

Secondly, the results imply a long-run positive feedback effect between electoral competitiveness, consumption, and tax rates. Lower taxes mean lower prices, which in turn encourage higher consumption. Higher consumption should then make it more difficult for politicians to increase tax rates in the future, even at low levels of competitiveness. As a result, there may be a "high consumption-low tax trap". Conversely, higher taxes mean higher prices, which helps to reduce consumption, and by doing so, make it easier for politicians to raise taxes in the future. Higher taxes also lead to clean innovation. Recent evidence suggests that automotive firms innovate more in clean technologies when they are located in countries with higher fuel prices (Aghion et al. 2016). By increasing the efficiency of automobiles, such innovation should further drive down consumption and again make it less risky for politicians to further increase tax rates. Taken together, these effects should generate strong path dependencies over time that push countries onto different fossil fuel consumption, taxation, and innovation trajectories. Those on high tax-low consumption trajectories should find it more politically feasible to purge fossil fuels from the economy over time. However, for those caught in a high consumption-low tax trap, changing trajectories will likely prove difficult, especially in times of heightened electoral competition. Such a dynamic may help to explain why high consumption-low tax countries such as the US have found it so politically difficult to increase fossil fuel prices via taxation (Rabe 2010).

6. The case of eco-taxation in Germany

To provide an illustrative case of how changes in electoral competitiveness generate changes in fossil fuel tax rates I examine fossil fuel tax increases adopted by the same Social Democratic – Green (Red-Green) coalition in two sequential electoral periods: 1998-2002 and 2002-2005. This within-country research design exploits variation in electoral competitiveness over the two periods, while holding constant potential confounding variables.

In March 1999, less than a year after winning the 1998 German federal elections, the Red-Green coalition adopted the Law Initiating the Ecological Tax Reform.[33] The goal was to make "labour cheaper and energy use more expensive" by increasing the price of polluting sources of

[33] Gesetz zum Einstieg in die ökologische Steuerreform

energy, in order to reduce their consumption and meet climate change-related goals, and use the increased revenues to boost employment through lowering employers' non-wage labour costs (Lightfoot and Luckin 2000, 163; Mehling 2013, 92).[34] As of April 1, 1999, existing excise tax rates on the household consumption of transport fuels (diesel and gasoline) were to increase by 3.07 Euro cents per litre (6 pfennings), on heating oil by 2.05 Euro cents per litre (4 pfennings) and natural gas by 0.16 Euro cents per kilowatt-hour (0.32 pfennings) (Beuermann and Santarius 2006, 920; Mehling 2013, 92-4).[35] The new revenues were earmarked to reduce employers' pension insurance contributions by 0.8 percent. In December 1999, the government adopted further tax increases via the Law Continuing the Ecological Tax Reform.[36] This second law was to come into force January 1, 2000 and mandated four additional tax increases on road fuels and electricity (of 3.07 Euro cents per litre and 0.26 Euro cents per kilowatt-hour, respectively), to be imposed on January 1 of 2000, 2001, 2002 and 2003.

Unsurprisingly, the taxes were unpopular with the public and industry (Beuermann and Santarius 2006; Mehling 2013, 93; Weidner and Mez 2008, 365). The situation was exacerbated in 2000 when global oil prices spiked and fuel price protests erupted in Germany and across Europe (Imig 2002). However, the government stayed the course and continued with annual increases in tax levels, even while the Christian Democrats (CDU), the main opposition party, advocated scrapping the tax and governments in other European countries moved to provide relief to consumers (Imig 2002; VerkehrsRundschau 2000a and 2000b).

Between 2000 and 2002 the government was ambivalent on whether it intended to increase rates after 2003 (Spiegel 2002; Taz 2001a and 2001b). The Greens wanted to continue to increase rates to meet environmental goals. However, initially the Social Democrats (SPD) would not publicly agree to additional increases, arguing instead that such a matter should be decided after the 2002 election. But by April 2002 (five months before the election) Chancellor Gerhard Schröder (SPD) publicly announced that the eco-tax would not be increased under a future SPD government. The party's 2002 election manifesto made the same declaration (SPD 2002, 23). The Greens on the other hand pledged to "further develop" the tax, while the opposition CDU/CSU pledged to not only *not* increase the eco-tax in 2003, but to abolish it altogether (CDU-CSU 2002, 9; Greens 2002, 19).

The Red-Green coalition was re-elected in 2002. During post-election bargaining, the Greens demanded further increases in the eco-tax while the SPD opposed them (Lutz 2002; NZ

[34] This type of reform is referred to as environmental tax reform, see Andersen and Ekins (2009).
[35] Industry was also targeted, but enjoyed exemptions. However, I focus here only on households.
[36] Gesetz zur Fortführung der ökologischen Steuerreform

2002). In the end, the coalition agreement left the door open to further increases by vaguely stating that in 2004 the government would "examine whether and how [ecological] taxation should be further developed" (SPD-Greens 2002, 21). This was a very different outcome than the explicit rate increases laid out in the 1998 agreement. However, not even two weeks after the agreement was signed, Chancellor Schröder (SPD) came out categorically against further increases, while the Greens continued to push for the opposite (BZ 2002). In the end, the SPD won out and the eco-tax was not increased after 2003.

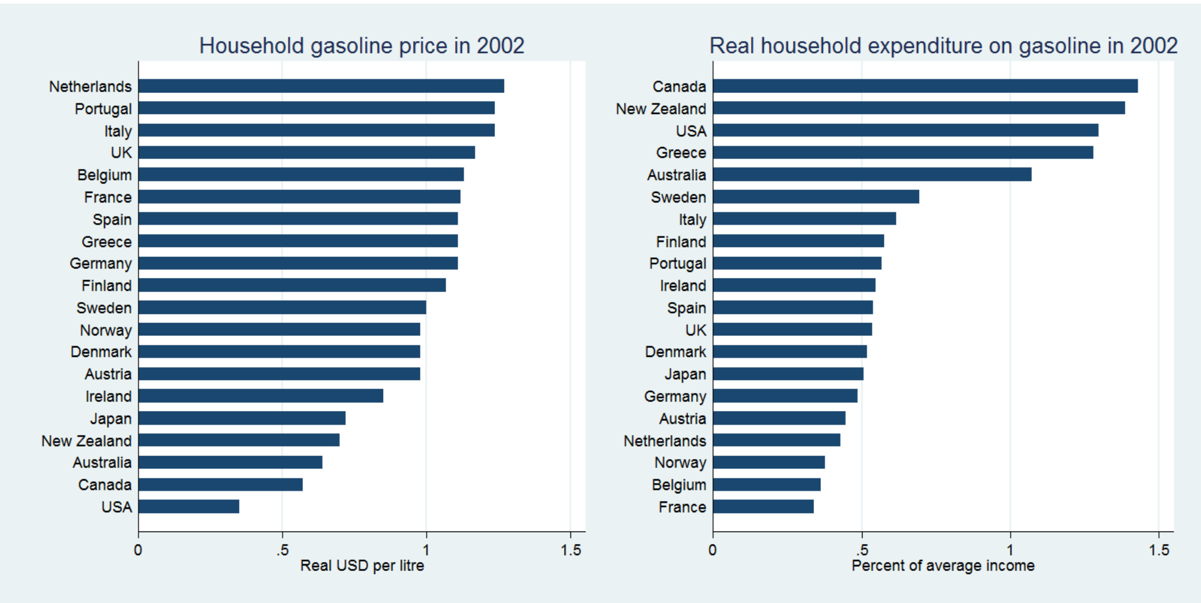
Why was the SPD willing to increase tax rates on fossil fuels after the 1998 election, but not after the 2002 election? Which variables changed enough between the two periods to explain this change in the party's behavior? Indeed, many political and fiscal variables changed little in 2002 compared to 1998 (Table 4). In public statements, Chancellor Schröder and other SPD politicians argued that the eco-tax could not be increased because "load limits" for consumers had been reached, suggesting that consumers could simply not afford additional increases (Spiegel 2002, Schultz and Wiskow 2002). However, the real price of gasoline (market price plus taxes) in Germany in 2002 was lower than eight other European countries (Figure 5 left side). Similarly, as a percentage of average income, German households spent less on gasoline in 2002 than fourteen other countries in the sample (Figure 5 right side). Most importantly, why was the SPD now suddenly concerned with unhappy consumers when in 2000 it had ignored public protests and demands to repeal the tax? For the answer I examine how the competitiveness of the electoral environment shifted dramatically after the 2002 election.

In the 1998 election, the SPD won a plurality of votes for the first time since 1972. The party enjoyed a 5.8% vote margin over the CDU/CSU – the largest vote margin over its rival in the post-war period (Döring and Manow 2016). During the electoral cycle from 1998-2002, the electoral competitiveness score for the party was 0.369; slightly higher than the German long-run average (1983-2012) of 0.314, but lower than the average for the entire sample of countries (0.438). From this relatively secure electoral position the party would have been open to increasing fossil fuel tax rates on voters, especially if it meant securing a coalition agreement with the Greens and leading a government for the first time since 1982. Hence, during coalition bargaining with the Greens the SPD agreed to specific increases in fossil fuel tax rates (SPD-Greens 1998, Section III.3). This result would not have necessarily been predicted before the election. The 1998 SPD election manifesto mentions ecological tax reform in very general terms, but offers no specifics on tax increases for voters (SPD 1998). Indeed, it states that "excessive and intolerable [eco-tax] burdens will not happen under the SPD" (SPD 1998, 36). But after the favorable electoral result, the

Table 4. Key variables across two electoral periods

	Electoral period	
	Oct. 1998 - Sept. 2002	Oct. 2002 - Sept. 2005
Dependent variables		
Tax increase (nominal Euro cents/litre)	12.27	3.07
Average percent change from previous year	4.5%	1.64%
Key independent variables		
Electoral competitiveness	0.369	0.638
SPD vote margin over CDU/CSU	5.8%	0%
Other independent variables		
Cabinet seat share of SPD	80%	78.6%
Cabinet seat share of Greens	20%	21.4%
Gasoline consumption (litres per capita) (avg.)	473	412
Saliency of environment	3.81	3.44
Budget deficit (% of GDP) (avg.)	1.98	3.725
Government debt (% of GDP) (avg.)	60.11	66.075
Inflation (avg.)	1.27%	1.42%

Figure 5. Household gasoline prices and expenditure in 2002



party could let the policy preferences of its coalition partner dominate its own vote-seeking preferences.

However, after the 2002 election the SPD found itself in a very different competitive environment. The party's margin over the CDU/CSU shrank to zero as both parties received 38.5% of the vote (Döring and Manow 2016). The electoral competitiveness score increased dramatically to 0.638. This sudden increase in electoral uncertainty would have re-ordered the SPD's preferences going into a new round of coalition bargaining with the Greens (a party that was now emboldened by an increased vote share of 1.9%). Given the importance of eco-tax policy to the Greens, it's no surprise that in order to secure a coalition agreement the SPD left the door open to further increases, even though it had already ruled them out in its own manifesto. However, the SPD would have already known that new increases were not going to happen. Given its weakened electoral position, the party would need to focus on maximizing votes in the next election (scheduled for 2006) over satisfying the policy preferences of its coalition partner. Therefore, while the SPD may have been able to safely ignore vocal voter opposition to the tax in the previous electoral period, the now highly competitive electoral environment meant that it had to be responsive to unhappy voters if it was to maximize its chances of winning the next election. Further increases in the fossil fuel tax rate simply entailed too much political risk for the vulnerable party and were therefore not increased after 2003.

7. Conclusion

For decades economists have been championing the use of carbon taxes as the most efficient policy instrument to address climate change. However, not all governments have been eager to obey such advice. This paper provides a resolution to this puzzle. For governments wishing to do so, increasing tax rates on goods that are widely consumed by voters, such as fossil fuels, entails political risk. I find evidence that in times of low electoral competitiveness, when governing parties feel secure in office, they are able to tolerate such risk and increase tax rates. I argue that these political conditions re-order the party's preferences, allowing its policy preferences to dominate its vote-seeking ones. However, when competitiveness is high and the outcome of the upcoming election is uncertain, the governing party's best strategy is vote-maximization. Under these conditions, the party is unlikely to increase fossil fuel tax rates for fear of losing marginal votes. I also find that the negative effect of electoral competitiveness depends on how politicians' perceive voter preferences regarding tax increases. When increases in tax rates are expected to impose large personal costs on voters, because consumption of the taxed good is high, increases in competitiveness generate even stronger incentives to respond to voter preferences and not increase rates.

The arguments and empirical results help to clarify how electoral incentives structure politicians' behavior vis-à-vis climate change policy, and by doing so fill a large gap in the political science literature (Keohane 2015). Existing work has hinted at the crucial role of such incentives, but has yet to offer a theoretical account of their micro-foundations or offered large-N empirical tests. Relatedly, the results contribute to research on the politics of long-term policymaking and structural change (Garrett 1993; Jacobs 2011). Electoral safety is hypothesized to be a key necessary condition for politicians to adopt policies that impose short-term costs for long-term benefits. Only governments that feel secure in office can assume the long-term time horizon needed for engaging in the politics of structural change. Conceptualising gasoline taxation as a type of long-term climate change mitigation policy that aims to hasten the decarbonisation of the national economy (long-term structural change *par excellence*), I find evidence that politicians are indeed most likely to increase tax rates when they enjoy a low risk of losing office.

The findings also shed light on the politics of climate policy instrument choice. In instances of low competition, we should expect governments to be more likely to directly increase the price of fossil fuels using taxes. However, when competitiveness is high such policies are unlikely to be politically feasible. Hence, politicians should be expected to use policy instruments that hide costs from voters. For example, in the case of the transport sector they should be expected to choose fuel efficiency standards (which directly impose costs on manufacturers) or subsidies for electric vehicles, over fuel tax increases for consumers. Indeed, electoral competitiveness should systematically structure how politicians distribute the short-term costs of climate policy between producers and consumers.

These results have at least two additional implications. The first is a two-way causal relationship between tax rates and consumption. Standard economy theory predicts that tax rates affect consumption, however the evidence here demonstrates that consumption also affects the tax rate by shaping politicians' perceptions of voter preferences. Secondly, the results imply a long-run positive feedback effect between electoral competitiveness, fossil fuel consumption, and fossil fuel taxation, which should generate strong path dependencies over time that push countries onto different fossil fuel consumption and taxation trajectories. For those caught in a "high consumption-low tax trap", changing trajectories will likely prove difficult, especially in times of heightened electoral competition. This effect should be present in the case of any good that is widely consumed by voters.

This paper is the first to offer a theoretical account and empirical analysis of the relationship between electoral incentives and fossil fuel taxation. There is much room for additional research. Future research could, for example, explore the two implications outlined above in more detail. Such an inquiry could further examine fossil fuel taxation or analyze other consumption taxes. Furthermore, further research could analyze the relationship between electoral competitiveness and taxes on other fossil fuels, such as natural gas or carbon-intensive electricity. Gasoline taxation is highly visible to voters and therefore may be much more politically salient than tax increases on other fuels. Similarly, the relationship between electoral incentives and industrial fossil fuel taxes is ripe for exploration.

To effectively address climate change, the standard prescription has been to increase the price of fossil fuels by increasing taxes on carbon. However, doing so is likely to entail too much political risk for governments when elections are close and fuel consumption is high, which helps to explain why the price of fossil fuels varies across countries and over time.

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Appendices

A.1 Summary statistics and data sources

Variable	Source	Obs.	Mean	Std. Dev.	Min	Max
Tax rate on household gasoline (nominal USD PPP/litre)	See Appendix A.2	615	44.05662	23.67485	1.0567	110.1974
Percent change from previous year in excise tax rate on household gasoline (based on national currency rates)	See Appendix A.2	595	4.260212	12.61673	-44.4445	125.0402
Loss probability (PM's party)	Kayser and Lindstädt (2015)	500	0.254038	0.21824	0	0.753807
Loss probability (Plurality party)	Kayser and Lindstädt (2015)	556	0.255294	0.219303	0	0.753807
Electoral competitiveness (PM's party)	Author's calculations based on data from Kayser and Lindstädt (2015)	500	0.438248	0.341747	0	0.997111
Electoral competitiveness (Plurality party)	Author's calculations based on data from Kayser and Lindstädt (2015)	556	0.438218	0.340829	0	0.997111
Gasoline consumption (100s of litres per capita)	IEA (2018b); OECD (2018a)	740	5.362002	3.701037	1.043068	19.05941
Expenditure on gasoline (% of average income spent on gasoline)	IEA (2018a); OECD (2018b)	511	0.008136	0.005526	0.002406	0.03846
Green cabinet seats (% of cabinet seats held by green parties)	Author's calculations based on Armingeon et al. (2016b)	740	0.510754	2.404018	0	18.75
Left cabinet seats (% of cabinet seats held by non-green left parties)	Armingeon et al. (2016a)	740	34.18116	38.80521	0	100
Environmental saliency (sum of per501 across all parties divided by number of parties)	Volkens et al. (2015)	727	5.640701	3.464567	0.09	18.33
Kyoto Protocol ratification	UNFCCC (2009)	740	0.317568	0.465845	0	1
Election year	Based on Armingeon et al. (2016a)	740	0.286487	0.452425	0	1
Budget deficit (Annual deficit as % of GDP)	Armingeon et al. (2016a)	712	2.971531	4.774042	-18.7	32.55
Government debt (Gross general government debt as % of GDP	Armingeon et al. (2016a)	740	68.5487	34.59579	13.03	227.67
Inflation (Annual growth rate of CPI)	Armingeon et al. (2016a)	740	4.383284	4.60194	-4.48	28.38

Oil production (Domestic oil production - tonnes per capita)	IEA (2018b)	720	1.500166	4.990637	0	35.08285
GDP growth (Annual growth rate of nominal GDP per capita)	OECD (2018b)	740	6.649041	5.456226	-9.42	26.45
VAT on gasoline (Value added tax rate on gasoline - %)	IEA (2016)	708	14.22989	8.695748	0	36
GDP per capita (Nominal – 10,000 USD PPP)	OECD (2018b)	740	2.419835	1.198997	0.42819	6.681222
Green vs growth (government ideology score)	Jahn (2016)	740	3.875514	6.269111	-16.7937	32.14057
Left vs right (government ideology score)	Jahn (2016)	740	1.898668	6.216379	-18.5844	21.95803
Single-party gov (Government in comprised of one party)	Based on Armingeon et al. (2016a)	733	0.436562	0.496298	0	1
Political constraints (polconiii)	Henisz (2017)	740	0.474438	0.091789	0.210909	0.718112
Social expenditures (Total public and mandatory private social expenditure as % of GDP)	Armingeon et al. (2016a)	630	21.48546	5.328031	9.87	36.01
Urbanization (% of population living in urban areas)	World Bank (2018)	740	76.21435	10.31916	41.979	97.818
Income tax structure (Taxes on individual income as a % of total taxation)	OECD (2018c)	729	29.39547	10.63441	9.7	61.6
EU membership	Armingeon et al. (2016a)	740	0.605405	0.489094	0	1

A.2 Data sources for excise tax rates on regular household gasoline

Country	Data source(s)
Australia	IEA (2016); James (1996)
Austria	IEA (2016)
Belgium	IEA (2016)
Canada	IEA (2016); International Fuel Tax Agreement (2015)
Denmark	IEA (2016); Statistics Denmark (2017)
Finland	IEA (2016)
France	IEA (2016)
Germany	IEA (2016); German Federal Ministry of Finance (2014)
Greece	IEA (2016)
Ireland	IEA (2016)
Italy	IEA (2016)
Japan	IEA (2016)
Netherlands	IEA (2016)
New Zealand	IEA (2016)
Norway	IEA (2016)
Portugal	IEA (2016)
Spain	IEA (2016)
Sweden	IEA (2016); SPBI (2016)
UK	IEA (2016); Institute for Fiscal Studies (2018)
USA	IEA (2016); US Federal Highway Administration (2018)

A.3 Measuring electoral competitiveness

To generate a measure of electoral competitiveness I measure the absolute distance of each governing party's loss probability from 0.5, or theoretically perfect competition, and then rescale the variable to a range of 0 to 1, where 1 is equal to perfect competition using Formula 1. This approach is very similar to the one used in American politics when calculating the Ranney Index (see for example Flavin and Shufeldt (2016)).

$$\left(\frac{1-|0.5-\mathit{loss\ probability}_{i,t}|}{0.5}\right)-1 \qquad (1)$$

Figure A.1 shows the original data from Kayser and Lindstädt (2015). Figure A.2 shows the new measure of electoral competitiveness.

Figure A.1 Loss probability of prime minister's party

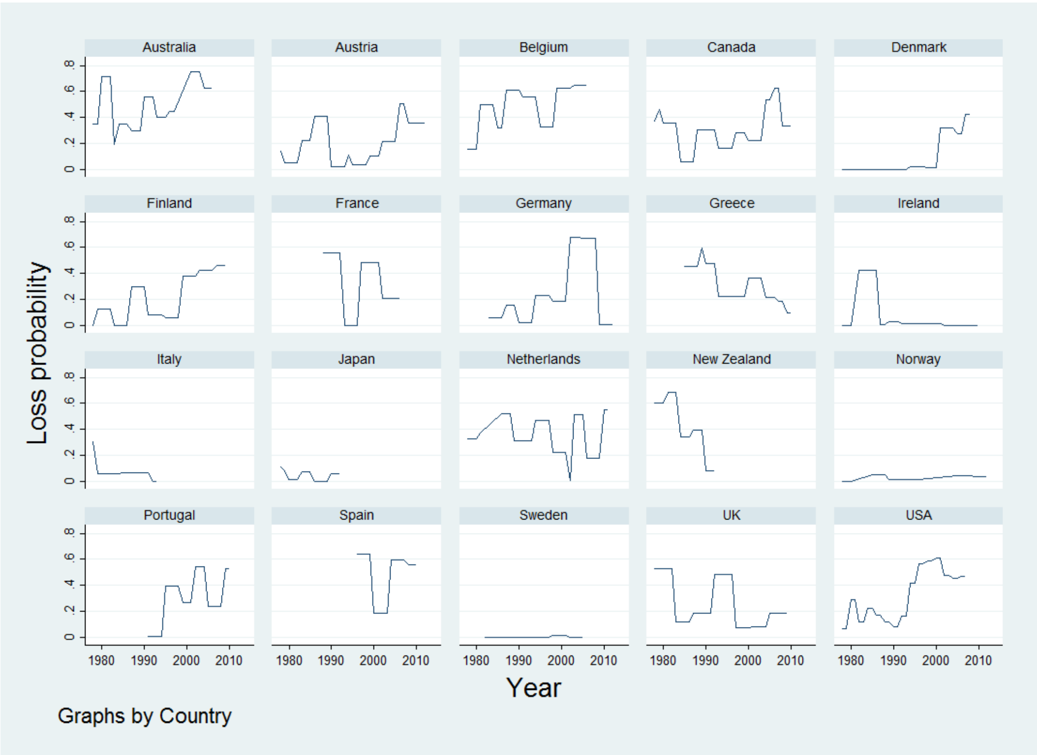
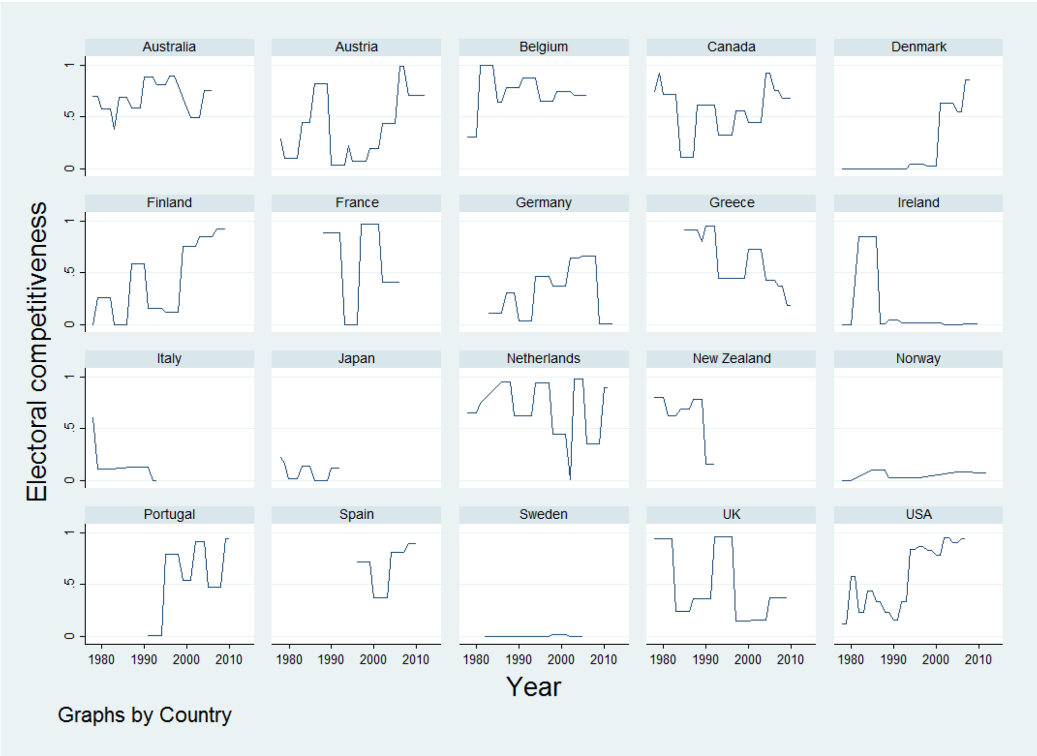


Figure A.2 Electoral competitiveness of prime minister's party



Validating new measure

My new measure assumes that loss probabilities that are equidistant from 0.5 generate the same incentives for the governing party. Parties that have a low probability of losing their seats plurality at the next election ("likely winners" with a loss probability of 0.25) and those from parties that have a high probability of doing so ("likely losers" with a loss probability of 0.75) will behave similarly. Both therefore receive the same score after the variable is transformed (a score of 0.5).

To test this, I generate a dummy variable that equals 1 when a party's loss probability is less than 0.5. These parties can be considered "likely winners" since they have a high probability of winning the next election. I then estimate a fixed effects model and interact this dummy with my measure of electoral competitiveness and include the same controls from the main analysis. If the interaction is not significant it would indicate that there is no statistical difference between the behaviour of likely winners and likely losers at different levels of electoral competitiveness. Table A.1 provides the results. The coefficient for the interaction term is not significant. Graphing the predictive margins, we see that the confidence intervals overlap, indicating no statistical difference in behaviour between the two groups at different levels of competitiveness (Figure A.3). I take this as evidence that validates the assumption that likely winners and likely losers behave similarly.

Figure A.3 Likely winners vs. likely losers

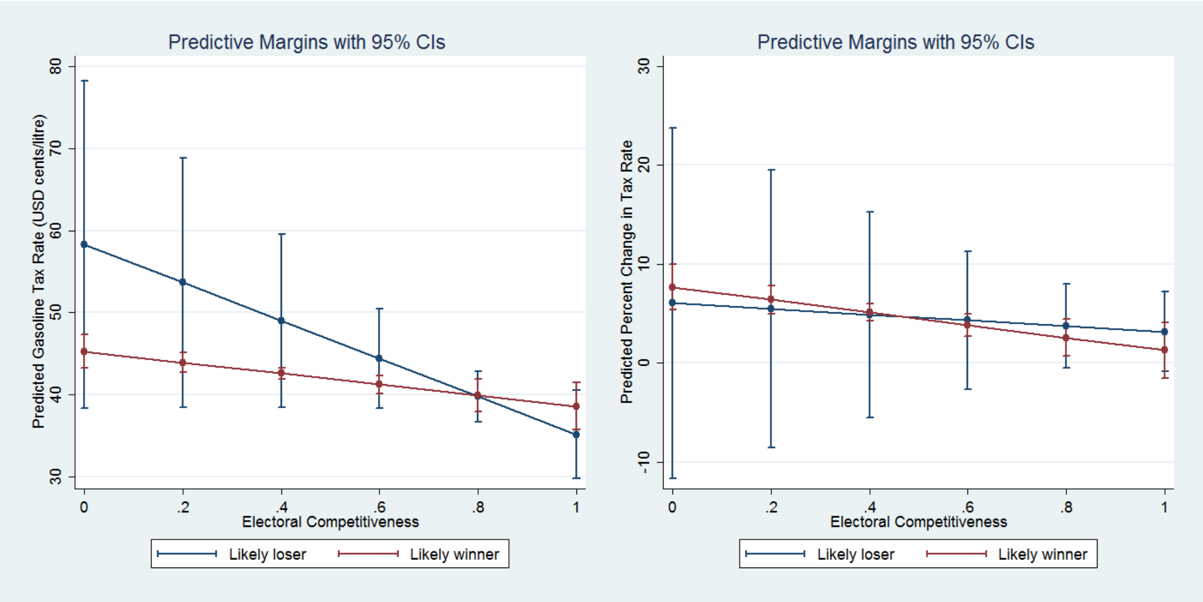


Table A.1 Validating new measure of electoral competitiveness

	(1) Tax level	(2) %Δ
Electoral competitiveness (t-1)	-23.11*	-2.877
	(12.28)	(9.708)
Loss probability dummy (t-1)	-13.00	1.621
	(10.43)	(9.613)
Electoral competitiveness * Loss probability dummy (t-1)	16.41	-3.500
	(12.75)	(10.38)
Green cabinet seats (t-1)	0.173	0.0558
	(0.201)	(0.238)
Left cabinet seats (t-1)	0.0452**	0.0215
	(0.0210)	(0.0324)
Environmental saliency (t-1)	-0.101	-0.154
	(0.333)	(0.274)
Kyoto Protocol (t-1)	14.00***	11.51***
	(3.467)	(3.448)
Election year	-0.993**	-2.447*
	(0.350)	(1.304)
Budget deficit (t-1)	0.257	0.615**
	(0.210)	(0.271)
Government debt (t-1)	0.137*	0.0199
	(0.0707)	(0.0533)
Inflation (t-1)	1.157**	1.454**
	(0.420)	(0.546)
Oil production (t-1)	0.929***	0.713**
	(0.194)	(0.308)
GDP growth rate (t-1)	-0.521**	-0.0219
	(0.215)	(0.350)
VAT rate (t-1)	0.296*	0.222
	(0.167)	(0.183)
Tax level (t-1)		-0.558***
		(0.136)
Country FE	Yes	Yes
Year FE	Yes	Yes
R^2 – within	0.798	0.279
R^2 – between	0.371	0.069
R^2 – overall	0.456	0.136
Countries	20	20
N	426	418

Notes: Robust standard errors in parentheses clustered at the country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A.4 Robustness tests

I subject my results to a wide variety of robustness tests (Tables A.2-A.4):

- **Alternative lag structure (Table A.2: Models 3-8):** I re-estimate the main results using a two-year lag structure. A two-year lag between the adoption and implementation of a tax increase is also theoretically plausible. Furthermore, this lag structure has been used in previous studies (Goel and Nelson 1999). Using this structure does not alter the results.
- **Jackknife resampling (Table A.2: Models 9-14):** It could be the case that one country is driving the results. To test this I re-estimate the main results using jackknife resampling, which drops each country from the dataset, calculates the estimates and then calculates the average across all of these estimates. The results indicate that my main results are not driven by any single country in the sample.
- **Expanded sample (Table A.3: Models 15-20):** My main results estimate the effect of electoral competitiveness from the perspective of the prime minister's party. However, I also have data on competitiveness from the perspective of the plurality party in the legislature, which is usually, but not always, the prime minister's party. To demonstrate that the relationship holds for the largest party in the legislature, regardless of whether it's the prime minister's party, I re-estimate the main results using electoral competitiveness scores for the plurality party. The results do not substantively differ from the main results.
- **Alternative measure of personal costs (Table A.3: Models 21-22):** The main results use gasoline consumption per capita as a proxy for personal costs. To ensure the robustness of the results I construct and test an alternative measure of personal costs: expenditure on gasoline as a percentage of household income. I construct this variable by multiplying gasoline consumption per capita by the pre-tax price per litre of gasoline and then dividing the product by nominal GDP per capita (Equation 2). I then re-estimate the models using this measure instead of gasoline consumption per capita. Using this alternative measure does not substantively alter the results.

$$\frac{gasoline\ consumption_{it} * pretax\ price_{it}}{nominal\ GDP\ per\ capita_{it}} \tag{2}$$

- **Additional controls (Table A.4: Models 23-28):** I include a wide variety of additional controls to further rule out possibilities of omitted variable bias:

- To control for differences in income over time, which may make voters more willing to pay higher fossil fuel taxes, I include nominal GDP per capita.
- To control for government ideology (in addition to partisanship) I use party scores for left vs right and green vs growth from Jahn (2016). The latter should be a good measure of the "greenness" of party's policy preferences.
- Coalition governments may find it easier than single-party ones to increase tax rates if multi-party governments make it more difficult for voters to assign responsibility and blame to specific parties. To control for this I include a dummy for single-party government.
- It may be that government politicians are simply increasing tax rates when they face fewer veto players. To control for this, I include a commonly used measure of political constraints from Henisz (2017).
- If governments use new revenues to fund spending on public goods, the temporal lag from the perspective of voters between the costs and benefits of tax increases may be reduced, making voters more amenable to such increases. Knowing this, governments may be more willing to increase rates. To control for this I include a measure of government social expenditure.
- The cost of a tax increase to voters could also depend on the availability of other transportation options. When other options are readily available, such as walking, cycling, or using public transport, politicians may predict that an increase in the gasoline tax will be less risky. Since no perfect measure exists for this, I use the proportion of the population living in urban areas. The assumption is that voters in urban areas will have more readily available transport alternatives that those living in rural areas.
- Governments may simultaneously increase taxes on fossil fuels and decrease other taxes, particularly on income (a process referred to as environmental tax reform). Similar to changes in social expenditure, this may bring immediate benefits to voters and thus make it more politically feasible to increase fossil fuel taxes. To control for this I include income tax revenue as a percentage of total taxation.
- To control for the influence of the European Union I add a dummy for EU membership, as some countries became members during the sample period. In 2003 the EU issued the Energy Tax Directive, which set a minimum gasoline tax rate for all member states of 0.359 Euros/litre; though this would have had little effect for my

sample. All EU countries in my sample apart from Greece had a tax rate higher than this in 2003.

Including these additional controls does not substantively change the results. None of the additional coefficients are significant at conventional levels. Comparing the within-unit R^2 values of the models with additional controls to the main results indicates that the expanded models fit the data little better than the parsimonious models.

- **Alternative specification (Table A.4: Models 29-32)**: To ensure that the results are not dependent on model specification, I estimate a logit model with country and year fixed effects as an alternative specification. The dependent variable equals 1 if the tax rate was increased and 0 otherwise. This is the most conservative setup since it assumes that the politics of all tax increases are equal, which in practice is not valid. For example, a large increase should be much more politically risky than a small one. However, it enables a very strict test of whether competitiveness decreases the probability of *any* tax increase. I find evidence of this. A one-unit increase in electoral competitiveness decreases the odds of a tax increase by between 60% and 70%., all else equal. (The difference between Models 29 and 30 and Models 31 and 32 is that the first set includes a dummy for Kyoto Protocol ratification. However, this specification drops a number of year dummies after 2003, indicating multicollinearity. I therefore estimate a second set of models without the Kyoto Protocol dummy to ensure the robustness of the results.)

Table A.2 Robustness tests (1)

	Two year lag structure						Jackknife resampling					
	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Tax level	%Δ	Tax level	%Δ	Tax level	%Δ	Tax level	%Δ	Tax level	%Δ	Tax level	%Δ
Loss probability	-31.65**	-16.54					-34.99**	-29.16**				
	(11.13)	(10.62)					(16.30)	(11.79)				
Loss probability^2	33.90**	11.91					38.77	33.47				
	(16.11)	(16.13)					(23.30)	(21.19)				
Elect. competitiveness			-7.424***	-5.487**	-0.928	-0.175			-7.857**	-5.576*	-0.848	6.374**
			(2.178)	(1.929)	(2.470)	(3.138)			(3.264)	(3.033)	(3.259)	(3.040)
Gasoline consump.					0.000242	0.991					-1.617	1.088
					(1.446)	(1.363)					(1.907)	(1.507)
Elect. comp. * Gas consump					-1.097***	-0.923					-1.199**	-2.107***
					(0.290)	(0.548)					(0.425)	(0.616)
Green cabinet seats	0.227	0.0505	0.232	0.0327	0.196	0.00585	0.212	0.0414	0.225	0.0492	0.198	-0.00130
	(0.198)	(0.226)	(0.205)	(0.218)	(0.205)	(0.222)	(0.326)	(0.691)	(0.314)	(0.673)	(0.277)	(0.668)
Left cabinet seats	0.0293	0.0111	0.0294	0.0119	0.0262	0.0129	0.0437	0.0231	0.0436	0.0220	0.0357	0.0215
	(0.0219)	(0.0257)	(0.0220)	(0.0264)	(0.0207)	(0.0247)	(0.0293)	(0.0416)	(0.0281)	(0.0415)	(0.0254)	(0.0433)
Environmental saliency	-0.167	-0.331	-0.164	-0.313	-0.140	-0.317	-0.110	-0.166	-0.110	-0.165	-0.0306	-0.142
	(0.344)	(0.264)	(0.342)	(0.262)	(0.334)	(0.272)	(0.404)	(0.362)	(0.401)	(0.349)	(0.386)	(0.350)
Kyoto Protocol	15.62***	11.08***	14.81***	11.10***	11.89***	9.488**	14.11**	12.66**	13.14*	11.81***	9.167**	7.601
	(3.423)	(3.566)	(3.162)	(3.374)	(2.157)	(3.597)	(6.533)	(4.704)	(6.691)	(3.993)	(3.738)	(8.839)
Election year	-0.391	-1.804	-0.344	-1.806	-0.352	-1.827	-1.113**	-2.444	-1.068**	-2.399	-1.004**	-2.406
	(0.419)	(1.419)	(0.415)	(1.434)	(0.380)	(1.447)	(0.459)	(1.515)	(0.459)	(1.557)	(0.456)	(1.534)
Budget deficit	0.484**	0.842**	0.493**	0.850**	0.509**	0.858**	0.240	0.604	0.250	0.615	0.285	0.642
	(0.215)	(0.341)	(0.217)	(0.343)	(0.203)	(0.333)	(0.309)	(0.388)	(0.311)	(0.384)	(0.283)	(0.384)
Government debt	0.131*	-0.0376	0.124*	-0.0368	0.122	-0.0207	0.143	0.0274	0.135	0.0193	0.107	0.0372
	(0.0687)	(0.0497)	(0.0666)	(0.0481)	(0.0711)	(0.0558)	(0.104)	(0.0681)	(0.0985)	(0.0610)	(0.0927)	(0.0749)
Inflation	1.080***	-0.0923	1.089***	-0.0806	1.063**	0.00429	1.175**	1.458*	1.177**	1.446*	1.085**	1.550**
	(0.348)	(0.484)	(0.355)	(0.492)	(0.399)	(0.503)	(0.507)	(0.720)	(0.517)	(0.714)	(0.402)	(0.724)
Oil production	0.859***	0.0367	0.865***	0.0436	0.789***	0.0136	0.919	0.727	0.922	0.719	0.835	0.624*
	(0.189)	(0.271)	(0.179)	(0.283)	(0.150)	(0.279)	(4.022)	(2.098)	(3.455)	(1.561)	(2.779)	(0.339)
GDP growth rate	-0.506**	0.914*	-0.492**	0.916*	-0.491***	0.926*	-0.529*	-0.0462	-0.511*	-0.0302	-0.550**	-0.00969
	(0.187)	(0.449)	(0.184)	(0.453)	(0.171)	(0.472)	(0.255)	(0.417)	(0.253)	(0.419)	(0.239)	(0.414)

VAT rate	0.278	0.120	0.294*	0.123	0.219	0.0805	0.278	0.211	0.300	0.227	0.173	0.102
	(0.169)	(0.217)	(0.167)	(0.214)	(0.162)	(0.235)	(0.228)	(0.289)	(0.229)	(0.280)	(0.224)	(0.271)
Tax level (t-1)		-0.430***		-0.432***		-0.455***		-0.571***		-0.565***		-0.620***
		(0.124)		(0.127)		(0.126)		(0.177)		(0.170)		(0.174)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 – within	0.794	0.300	0.794	0.300	0.801	0.304	0.796	0.281	0.795	0.278	0.809	0.299
R^2 – between	0.362	0.041	0.356	0.046	0.487	0.066	0.329	0.058	0.324	0.071	0.674	0.082
R^2 – overall	0.470	0.177	0.467	0.178	0.564	0.151	0.462	0.132	0.460	0.135	0.724	0.140
Countries	20	20	20	20	20	20	20	20	20	20	20	20
N	433	426	433	426	433	426	426	418	426	418	426	418
Lag structure	Two year						One year					
Standard errors	Cluster robust						Jackknife					

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.3 Robustness tests (2)

	Plurality party						Alternative measure of personal costs	
	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	Tax level	%Δ	Tax level	%Δ	Tax level	%Δ	Tax level	%Δ
Loss probability (t-1)	-34.99**	-29.16**						
	(12.40)	(10.47)						
Loss probability² (t-1)	38.77**	33.47*						
	(17.90)	(17.75)						
Elect. competitiveness (t-1)			-8.281***	-5.946**	-1.814	5.217**	1.295	0.0693***
			(2.332)	(2.438)	(2.427)	(2.166)	(3.040)	(0.0226)
Gasoline consump. (t-1)					-2.045	0.596		
					(1.268)	(1.279)		
Elect. comp. * Gas consump. (t-1)					-1.105***	-1.974***		
					(0.301)	(0.339)		
Expenditure on gasoline							299.5	18.55***
							(443.2)	(2.734)
Elect. comp. * Expenditure on gasoline (t-1)							-1182.4***	-18.22***
							(384.5)	(3.728)
Green cabinet seats (t-1)	0.212	0.0414	0.301	0.166	0.253	0.109	0.217	0.00129
	(0.185)	(0.241)	(0.187)	(0.235)	(0.161)	(0.228)	(0.159)	(0.00205)
Left cabinet seats (t-1)	0.0437**	0.0231	0.0343*	0.0112	0.0314*	0.0116	0.0331*	-0.000105
	(0.0209)	(0.0318)	(0.0165)	(0.0217)	(0.0153)	(0.0236)	(0.0185)	(0.000248)
Environmental saliency (t-1)	-0.110	-0.166	-0.0839	-0.0256	0.0119	-0.0162	-0.0448	-0.00104
	(0.319)	(0.272)	(0.295)	(0.244)	(0.268)	(0.236)	(0.321)	(0.00221)
Kyoto Protocol (t-1)	14.11***	12.66***	13.99***	11.77***	9.727***	7.347*	8.922**	0.103**
	(3.658)	(3.563)	(3.272)	(2.855)	(2.336)	(4.041)	(3.178)	(0.0434)
Election year (t-1)	-1.113***	-2.444*	-1.256***	-2.604*	-1.170***	-2.622*	-1.044**	-0.0171
	(0.359)	(1.318)	(0.386)	(1.312)	(0.380)	(1.308)	(0.372)	(0.0119)
Budget deficit (t-1)	0.240	0.604**	0.299	0.678**	0.330	0.703**	0.163	0.00440**
	(0.216)	(0.267)	(0.244)	(0.264)	(0.217)	(0.257)	(0.179)	(0.00179)
Government debt (t-1)	0.143*	0.0274	0.113	0.0115	0.0851	0.0182	0.141*	0.000414
	(0.0735)	(0.0548)	(0.0688)	(0.0450)	(0.0588)	(0.0540)	(0.0752)	(0.000464)
Inflation (t-1)	1.175**	1.458**	0.980**	1.343***	0.869**	1.388***	1.419***	0.0157**
	(0.418)	(0.537)	(0.404)	(0.459)	(0.372)	(0.472)	(0.477)	(0.00695)

Oil production (t-1)	0.919***	0.727**	0.797***	0.443**	0.719***	0.366**	0.983***	0.00649**
	(0.214)	(0.299)	(0.138)	(0.186)	(0.118)	(0.155)	(0.237)	(0.00251)
GDP growth rate (t-1)	-0.529**	-0.0462	-0.320	0.0790	-0.381*	0.0914	-0.425	-0.00126
	(0.222)	(0.342)	(0.225)	(0.304)	(0.221)	(0.313)	(0.254)	(0.00289)
VAT rate (t-1)	0.278	0.211	0.267	0.142	0.161	0.0275	0.181	0.00444*
	(0.167)	(0.187)	(0.160)	(0.167)	(0.143)	(0.149)	(0.170)	(0.00214)
Tax level (t-1)		-0.571***		-0.531***		-0.589***		-0.00569***
		(0.132)		(0.134)		(0.134)		(0.00128)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 - within	0.796	0.281	0.812	0.264	0.826	0.282	0.779	0.403
R^2 – between	0.329	0.058	0.333	0.072	0.712	0.072	0.332	0.074
R^2 - overall	0.462	0.132	0.486	0.142	0.753	0.162	0.424	0.170
Countries	20	20	20	20	20	20	20	20
N	426	418	465	456	465	456	374	372
Sample			Plurality party				PM's party	

Notes: Robust standard errors in parentheses clustered at country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4 Robustness tests (3)

	Additional controls						Logit models			
	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
	Tax level	%Δ	Tax level	%Δ	Tax level	%Δ	Tax increase			
Loss probability (t-1)	-35.72**	-21.74*								
	(12.68)	(11.23)								
Loss probability^2 (t-1)	38.94*	20.17								
	(19.46)	(18.48)								
Elect. competitiveness (t-1)			-7.742***	-5.088*	-0.691	9.142***	0.301**	2.356	0.359*	2.567
			(2.115)	(2.838)	(3.278)	(2.522)	(0.169)	(2.530)	(0.195)	(2.552)
Gasoline consump. (t-1)					-2.475**	2.927		2.191**		2.366***
					(1.108)	(1.738)		(0.750)		(0.782)
Elect. comp. * Gas consump. (t-1)					-1.160**	-2.524***		0.683**		0.708**
					(0.493)	(0.498)		(0.130)		(0.114)
Green cabinet seats (t-1)	0.207	-0.175	0.183	-0.200	0.170	-0.219	1.117**	1.119**	1.107*	1.104*
	(0.262)	(0.281)	(0.258)	(0.279)	(0.228)	(0.261)	(0.0610)	(0.0628)	(0.0594)	(0.0608)
Left cabinet seats (t-1)	0.0581**	0.000157	0.0574**	-0.00132	0.0425*	-0.00235	1.007	1.008*	1.009**	1.010**
	(0.0227)	(0.0325)	(0.0219)	(0.0327)	(0.0218)	(0.0281)	(0.00445)	(0.00460)	(0.00433)	(0.00444)
Environmental saliency (t-1)	-0.237	-0.341	-0.218	-0.303	-0.0545	-0.299	1.047	1.041	1.049	1.040
	(0.432)	(0.321)	(0.416)	(0.289)	(0.370)	(0.297)	(0.0577)	(0.0587)	(0.0569)	(0.0581)
Kyoto Protocol (t-1)	14.46***	13.83***	13.62***	13.40***	8.413***	8.552	2.41202e+10	5.07369e+10		
	(2.528)	(4.317)	(2.426)	(4.207)	(1.438)	(5.217)	(4.73433e+14)	(1.40565e+15)		
Election year (t-1)	-1.193***	-2.636*	-1.152***	-2.615*	-1.083***	-2.590*	0.907	0.916	0.888	0.899
	(0.384)	(1.434)	(0.388)	(1.438)	(0.341)	(1.442)	(0.260)	(0.266)	(0.248)	(0.256)
Budget deficit (t-1)	0.152	0.648	0.205	0.683*	0.305	0.621	1.057	1.052	1.059	1.061
	(0.254)	(0.387)	(0.262)	(0.385)	(0.230)	(0.378)	(0.0617)	(0.0622)	(0.0601)	(0.0611)
Government debt (t-1)	0.163**	0.0144	0.161**	0.0150	0.136*	0.0627	0.992	1.001	0.992	1.003
	(0.0684)	(0.0726)	(0.0656)	(0.0673)	(0.0656)	(0.0708)	(0.0119)	(0.0131)	(0.0116)	(0.0129)
Inflation (t-1)	1.309***	1.430**	1.294**	1.404**	1.048**	1.576**	1.222**	1.288**	1.185*	1.256**
	(0.450)	(0.513)	(0.453)	(0.509)	(0.445)	(0.588)	(0.124)	(0.136)	(0.114)	(0.126)
Oil production (t-1)	0.886***	0.354	0.876***	0.339	0.809***	0.0884	0.905	0.837	0.943	0.842
	(0.261)	(0.372)	(0.245)	(0.382)	(0.214)	(0.277)	(0.176)	(0.157)	(0.198)	(0.168)
GDP growth rate (t-1)	-0.480	-0.0945	-0.494	-0.0999	-0.615**	-0.0838	0.968	0.984	0.960	0.977
	(0.306)	(0.353)	(0.304)	(0.353)	(0.287)	(0.332)	(0.0685)	(0.0710)	(0.0658)	(0.0682)

VAT rate (t-1)	0.181	0.434*	0.206	0.436*	0.0797	0.354	1.060*	1.049	1.043	1.034
	(0.242)	(0.232)	(0.241)	(0.219)	(0.229)	(0.215)	(0.0306)	(0.0316)	(0.0294)	(0.0305)
GDP per capita (t-1)	-4.969	-0.778	-4.820	-0.321	-3.036	0.822				
	(3.487)	(3.476)	(3.576)	(3.204)	(3.236)	(3.633)				
Green ideology (t-1)	-0.0221	-0.216	-0.0520	-0.227	-0.0992	-0.250				
	(0.242)	(0.319)	(0.237)	(0.339)	(0.233)	(0.310)				
Left vs right (t-1)	0.163	-0.0271	0.165	-0.0328	0.175	0.0466				
	(0.164)	(0.245)	(0.156)	(0.260)	(0.169)	(0.229)				
Single-party gov (t-1)	-1.343	0.303	-1.553	0.599	0.775	2.939				
	(2.230)	(5.062)	(1.868)	(4.445)	(1.738)	(4.725)				
Political constraints (t-1)	6.583	-5.425	3.492	-6.526	4.695	-4.459				
	(11.87)	(18.16)	(11.92)	(17.74)	(12.30)	(18.05)				
Social expenditure (t-1)	-0.0893	0.0417	-0.197	-0.00818	-0.468	-0.118				
	(0.633)	(0.697)	(0.675)	(0.680)	(0.632)	(0.651)				
Urbanization (t-1)	0.129	-0.326	0.126	-0.313	0.431	-0.364				
	(0.606)	(0.438)	(0.604)	(0.430)	(0.490)	(0.412)				
Income tax (t-1)	-0.325	-0.0209	-0.360	-0.0457	-0.242	0.189				
	(0.430)	(0.518)	(0.423)	(0.519)	(0.444)	(0.492)				
EU (t-1)	-1.127	-8.209	-1.269	-8.011	-0.561	-8.457				
	(5.170)	(5.563)	(5.368)	(5.262)	(5.176)	(5.270)				
Tax level (t-1)		-0.522***		-0.514***		-0.533***	0.915***	0.920***	0.933***	0.939***
		(0.148)		(0.150)		(0.154)	(0.0210)	(0.0224)	(0.0198)	(0.0211)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 - within	0.795	0.293	0.793	0.291	0.809	0.317				
R^2 – between	0.437	0.028	0.422	0.036	0.627	0.072				
R^2 - overall	0.523	0.121	0.509	0.123	0.705	0.081				
Log likelihood							-161.70	-157.61	-170.12	-165.49
Countries	20	20	20	20	20	20	20	20	20	20
N	406	400	406	400	406	400	418	418	418	418

Notes: Coefficients for logit models are odds ratios. Robust standard errors in parentheses clustered at country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$