Determinants of Public Acceptability for a Carbon Tax: Exploring New Measures of Self-Interest and Ideology

Favre, Mathis Xavier Julien

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Exploring New Measures of Self-Interest and Ideology

Universiteit Leiden

Mathis Favre

Supervisor: Dr. J. A. Robison

Second Reader: Dr. J. J. M. van Holsteijn

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Department of Political Science, Leiden University

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Table of contents

Introduction

Heatwaves, droughts, desertification, and rising sea levels. Despite their name, the increased occurrence of natural disasters is anything but natural and heavily correlated with increasing global temperatures (IPCC, 2021). The release of the first part of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2021) has granted to anthropogenic activities the total responsibility of increasing average temperatures. The growing perceived urgency as testified by those international reports is arguably conducive to greater ambition in terms of domestic climate action and international agreements. Carbon pricing, as a climate mitigation policy combining carbon taxes and emissions trading schemes, is often mentioned in those international agreements and already covers 23 percent of worldwide greenhouse gases (GHG) emissions (Worldbank, 2022). Greenhouse gases represents "gaseous constituents of the atmosphere […] that absorb and emit radiation [causing] the greenhouse effect (IPCC, 2014, Glossary). The implementation of carbon taxes, specifically, allows for the integration of environmental negative externalities in the prices of goods, heating, and gasoline (Andrew, 2008) — de facto decreasing both their demand and further private investments in those sectors. This climate mitigation policy is considered to be a highly cost-efficient mitigation tool (IPCC, 2022; IMF, 2019) and is therefore essential for a transition to a post-carbon society.

Nevertheless, sizable political barriers exist regarding the implementation of efficient climate mitigation policies both at the individual and institutional level (Biesbrock, Klostermann, Termeer & Kabat, 2011). One of those limitations is that of public acceptability or support which tends to be relatively low due to individuals concern about cost distribution (Douenne & Fabre, 2019; Kallbekken, Garcia & Korneliussen, 2013; Carattini, Kallbekken & Orlov, 2019) and individuals misbeliefs about policy characteristics (Douenne & Fabre, 2019; Hasanaj & Stadelmann-Steffen, 2022). As for carbon taxes, and despite their argued effectiveness, vigorous opposition exists (Douenne & Fabre, 2019; Rhodes, Axsen & Jaccard,

2017; Baranzini & Carattini, 2017) which ties the hands of policymakers as they face a dilemma between popularity and climate action.

The gap between the effectiveness of this tool and its general low public acceptability has led scholars to focus on the different factors underlying support or acceptability of a carbon tax. Existing research has found that self-interest (Tobler, Visschers & Siegrist, 2012; Harring, Jagers & Matti, 2019; Baranzini & Carattini, 2017; Umit & Schaffer, 2020; Arndt, Halikiopoulou, & Vrakopoulos, 2022; Rhodes, Axsen & Jaccard, 2017) and ideology — leftist ideology being associated with greater acceptability (Harring, Jagers, & Matti, 2019. Linde, 2018a; Linde 2018b; Tobler, Visschers, & Siegrist, 2012) — matter to some extent, but often less than other factors such as policy beliefs and climate change evaluations (Bergquist, Nilsson, Harring & Jagers, 2022). Nevertheless, those modest results of self-interest and ideology are potentially driven by three important limitations exhibited in existing empirical accounts' operationalizations.

Firstly, none of the reviewed articles went beyond mere left-right self-placement as a measure of ideology. Yet, ideology appears to be more complex than this unidimensional measure due to differentiated understandings of the 'left' and the 'right' (Bauer, Barbera, Ackermann, & Venetz, 2016) and due to the existence of more fine-grained patterns of belief-system often composed of two-dimensions with socio-economic concerns on one hand and cultural concerns on the other (Duckitt and Sibley, 2010; Schwartz, Caprara, Vecchione, Bain, Bianchi, Caprara, Cieciuch, et al. 2014; Malka, Lelkes, & Soto, 2019; Elchardus, & Spruyt, 2012; Carmines, Ensley, & Wagner, 2012).

Secondly, self-interest has been measured, at best with energy dependency and the place of living (Umit & Schaffer, 2020), and at worst merely with the income level, which (1) can be subject to many antecedent variables, (2) can have rather weak effects in attitudinal studies (Chong, 2013), (3) and is often used as a mere covariate measure, therefore outside of any

theoretical considerations. Still, other self-interest variables, especially occupation-centered ones can be promising indicators (Dancygier & Donnelly, 2012; Malhotra, Margalit & Mo, 2013) and are understudied in this context. Indeed, as we spend most of our time working and since it represents the primary mean of survival for most individuals, we could expect any policy impacting drastically one's job-sector to have consequential effects on one's attitudes regarding that exact policy. Regarding climate policies, the level of GHG emissions of the respondents' job sector likely possess those disruptive effect for high-emitting sectors. Indeed, Bechtel, Genovese, and Scheve (2019) found a statistically significant effect of the type of industry where one is employed with support for international climate agreements. This is obviously distinct from domestic carbon taxes but still shed light on individuals' capacity to estimate the vulnerability of their industry to increased carbon prices. They nevertheless used a dichotomous variable with polluting and non-polluting industries which limits the precision of their results.

Thirdly and finally, few studies have undertaken a cross-national analysis of those two predictors on the acceptability of a carbon tax, and the ones that did (Umit & Schaffer, 2020; Arndt, Halikiopoulou & Vrakopoulos, 2022; Berguist, Nilsson, Harring & Jagers, 2022) possessed several shortcomings. Berguist, Nilsson, Harring and Jagers (2022) meta-analysis do not focus directly on carbon taxes. Umit & Schaffer (2020) provided a robust operationalization of self-interest including the place of living and energy dependency but did not include ideology or the respondent's job-sector level of GHG emissions. And Arndt, Halikiopoulou, and Vrakopoulos (2022) provided an inter-regional analysis with regional-level variables, preventing intra-regional differences among individuals from being expressed.

Therefore, and as an answer to those limitations, the following research question will guide this thesis: "to what extent does the GHG emissions level of a job-sector and two-dimensional ideology impact public acceptability for a carbon tax?". The above-mentioned

shortcomings in the existing literature give the impetus for a replication-type of work applied in new contexts and over 23 countries, with the addition of an empirically promising indicator for self-interest which is the GHG emissions levels of the respondent's job-sector and an improved operationalization of ideology disentangling socio-economic and cultural dimensions. The results are three-fold, (1) while the direction of the effect was expected, higher levels of GHG emissions decreases acceptability, respondent's job-sector levels of GHG emissions do not impact as substantially as thought acceptability for a carbon tax, (2) both egalitarian socio-economic and progressive cultural attitudes are associated with higher expected acceptability for a carbon tax, (3) and yet cultural considerations have larger expected effects on acceptability than socio-economic ones. Those are important since gaining support for such a necessary climate mitigation policy tool might therefore imply as much sophisticated redistributive characteristics as pedagogical and transparency work upstream. Additionally, individuals seem to poorly connect such a tax with the success or survival of their job-sector, which seems to favor demand-side pushes through economic compensations rather than offer or business-side pushes to gain acceptability.

This paper will proceed as follow. The following section will review the literature and detail the theoretical basis for the relevance of studying the impact of self-interest and ideology on public acceptability of a carbon tax. Then I will detail the data used, the operationalization of the variables, and the type of statistical analysis undertaken. The penultimate section will provide a descriptive analysis and statistical tests of the hypotheses. Finally, the paper will conclude with a broader discussion of the findings and their political implications.

Evidence and Theory

Self-interest

Self-interest constitutes a recurrent and fundamental factor of attitudinal analyses ever since the *The American Voter* (Campbell, 1960) which provided evidence of self-interest patterns of vote for social welfare policies. Yet, and since the 90s, a growing dissatisfaction and disenchantment with the explanatory power of self-interest factors appeared, as testified by general weak effects on policy preferences (Chong, 2013; Campbell, 1990; Bechtel, Michael, Hainmueller & Margalit, 2014). Opponents of this view have emphasized the contextual nature of self-interest considerations for political attitudes, which seems to increase in contexts of clear, direct, and immediate loses (Chong, Citrin & Conley, 2003; Doherty, Gerber & Green, 2006; Weeden & Kurzban, 2017). The carbon tax is arguably part of this category. Indeed, the effect of a carbon tax is materialized through general prices increase, especially, for the most polluting goods which will unambiguously hit citizens' pocketbooks — see the Yellow Vest Movement reacting to an increase of the French carbon tax (Schmid, & Guinaudeau, 2022). There are thus reasons to believe that self-interest, defined as "making cost-benefit calculations to determine which alternatives are best for [people] given their personal circumstances" (Chong, Citrine & Conley, 2003) will play a significant role in attitude formation for a carbon tax.

Theoretically, one might explain the effect of self-interest on a carbon tax acceptability using rational choice theory and standard economic theory of cost distribution. Indeed, those would assume that individuals can undertake rational computations to maximize their utility and more or less correctly (bounded rationality) identify the effect of a policy on their material conditions. From there, one can expect two types of factors relating to self-interest to be determinant in the acceptability of a carbon tax.

The first one is, in line with bounded rationality, the cost 'perceived' by individuals of a carbon tax. Several studies, using private cost perception as an indicator of self-interest, found significant and nonnegligible negative effect of higher cost perceptions on acceptability of a

carbon tax (Tobler, Visschers & Siegrist, 2012; Baranzini & Carattini, 2017; Arndt, Halikiopoulou & Vrakopoulos, 2022) operationalized as fear of decreased purchasing power or fear of losing one's job. Yet, the use of cost perception as a measure of self-interest, despite rightly emphasizing the bounded rationality of individuals has one important limitation — cost perception is potentially a mediator of two different dimensions. One socio-psychological where motivated reasoning and biases based on previous beliefs and ideology impact cost perception (Taber, & Lodge, 2006; Kahan, 2012; Druckman & McGrath, 2019). And one socio-demographic, merely based on respondent's objective capacity to bear the extra cost, which can lead to a correlation with income (Baranzini, & Carattini, 2017). Those two thus reduce the internal validity of cost perception.

A second type of indicators of self-interest which might matter for acceptability of a carbon tax relates to socio-demographics variables, three of them were present in the reviewed literature (income, place of living, and energy dependency). First, a low income increases a households' vulnerability to inflation, especially for primary products with low elasticity of demand such as gasoline, gas, or fuel — increased prices which are the consequence of increased taxes on carbon. Income's effects were found to be statistically significant and nonnegligible (Arndt, Halikiopoulou & Vrakopoulos, 2022; Dietz, Dan & Schwom, 2007; Baranzini & Carattini, 2017). Second, living in rural areas might impact acceptability due to greater reliance on car use and a reduced amount of transportation alternatives (Umit & Schaffer, 2020; Kallbecken & Sælen, 2011). Very strong effects have been found for this indicator especially (Umit & Schaffer, 2020; Arndt, Halikiopoulou & Vrakopoulos, 2022; Rhodes, Axsen & Jaccard, 2017). Third, having higher energy dependency implies lower elasticity of demand which can decrease acceptability as some household can more hardly decrease their energy consumption, due to, for instance, weak thermal insulation or geographical remoteness from the workplace (Umit, & Schaffer, 2020). Nevertheless, the ESS-

8 survey item used for energy dependency by Umit and Schaffer (2020) possesses a highly subjective dimension, limiting the reliability of the measure.

There are thus both theoretical and empirical reasons to think that self-interest, mostly through socio-demographics and contextual factors, do matter for acceptability of a carbon tax.

This thesis will nevertheless provide a different, understudied, operationalization of self-interest. This indicator is the GHG emissions of the respondent's job-sector. Indeed, the Ricardo-Viner model, also called sector-based approach, emphasizes how trade policies attitudes are not necessarily articulated around social class, but through the sector of employment of an individual (Mukherjee, Smith & Li, 2009). Any trade policy having adverse effects on one's job-sector will likely threaten one's employment which, it is assumed, is perceived by the individual. Yet, this model is theoretically extendable to other policy areas where a policy can have similar negative effects on a sector and the jobs associated with it. Evidence regarding attitudes toward immigration and their economic sector-related groundings is one example of it (Dancygier & Donnelly, 2012; Malhotra, Margalit & Mo, 2013). There are two additional reasons why the job-sector appears as a promising operationalization of self-interest for acceptability of a carbon tax. First, a carbon tax will mostly impact polluting sectors and might trigger a response of fear of job-loss, higher intra-sector competition, or decreasing salaries. Second, and as emphasized by Weeden and Kurzban (2017) and Fordham and Kleinberg (2012), disentangling individual self-interest and socio-tropic preferences is not straightforward. In this scenario, a carbon tax can also be seen as penalizing co-workers and relatives working in the same company or sector, as well as one's capacity to support his or her family financially. These considerations logically lead to the following hypothesis:

H1: Individuals working in high polluting sectors will express lower acceptability for a carbon tax than those working for less polluting ones.

Ideology

Another predictor with potentially substantive effect on carbon tax acceptability is ideology. The relevance of ideology for a carbon tax acceptability can be explained by the chosen distribution of costs associated with carbon tax, imparting a highly political dimension — "who gets [loses] what, when, how" (Lasswell, 1936). This is evidenced by Harring, Jagers, and Matti's (2017) study which showed how the effect of ideology on acceptability was heavily dependent on the type of climate policy at stake. Indeed, ideology went from one the most important predictor for a carbon tax to a modest one for climate regulation and subsidies (Harring, Jagers, & Matti, 2017). These results tend to confirm the saliency of ideological considerations for a carbon tax acceptability. Consensus around a common definition of ideology and a theorization of its causes seems currently out of reach (Gerring, 1997; Federico, & Malka, 2018; Federico, 2019). This thesis will therefore limit its definition to "a configuration of ideas and attitudes in which the elements are bound together by some form of constraint or functional interdependence" (Converse, 1964, p. 207).

In the carbon tax literature, ideology has been recurrently included in multivariate models, yet often as a statistical control (Linde, 2018a; Harring, Jagers, & Matti, 2019; Linde 2018b; Umit, & Schaffer, 2020; Baranzini, & Carattini, 2017). Nevertheless, and when included as a predictor, ideology has led to encouraging results as more leftist or liberal (for the US) individuals were associated with greater acceptability of a carbon tax (Linde, 2018a; Harring, Jagers, & Matti, 2017, 2019; Linde 2018b; Dreyer, & Walker, 2013; Dietz, Dan, & Schwom, 2007; Tobler, Visschers, & Siegrist, 2012). Tobler, Visschers, and Siegrist (2012), in a study in Switzerland, tried to disentangle support for climate-friendly behavior and acceptability for climate policies with a large variety of predictors. They found that for CO2 restrictions policies (i.e., carbon or fossil fuel tax), ideology was the second most important predictor after perceived climate benefits, with acceptability for a carbon tax being higher for individuals on the left-end of the spectrum. Still, for some other studies, the effect of ideology or political orientation was

rather modest (Bergquist, Nilsson, Harring, & Jagers, 2022; Baranzini, & Carratini, 2017; Arndt, Halikiopoulou, & Vrakopoulos, 2022), or leading to multicollinearity with other predictors such as environmental predispositions and values (Rhodes, Axsen, & Jaccard, 2017).

These supportive yet nuanced and modest results are puzzling as ideology tend to be an important predictor for public attitudes in general. One cause of these results might be the unquestioned and systematic use of left-right self-placement measure, and the assumed unidimensionality of ideology, both of which raise questions regarding the meaning, purpose, and usefulness of such a homogenous use (Wood, & Oliver, 2012).

Indeed, there is growing evidence that belief systems or ideological constraints are structured differently than through left-right patterns for many individuals (Malka, Lelkes, & Soto, 2019; Elchardus, & Spruyt, 2012; Carmines, Ensley, & Wagner, 2012), and are in fact two-dimensional — with a socioeconomic dimension orthogonal to a cultural dimension. This gap between the assumed and the empirical structure of ideological constraint is more prevalent in post-communist countries and for less sophisticated and informed individuals (Malka, Lelkes, & Soto, 2019), both of which represents a non-negligeable part of the European population. Going beyond the left-right continuum is therefore a way to (1) better integrate a substantial portion of the respondents in ideological theoretical frameworks , (2) enhance our understanding of the relative weight of cultural and socio-economic considerations when assessing public acceptability of political issues, here a carbon tax, and (3) reduce measurement error due to a gap between symbolic, or subjective, ideology and operational ideology (Ellis, & Stimson, 2009). To provide a better operationalization of ideology than left-right self-placement and in order to find the most relevant dimensions along which ideology materializes itself, one need to understand the causes of it — as those may inform us on its true structure.

Academic consensus over the causes of ideology and its chronological process is not established. This is testified by the various and competing models which try to integrate

personality traits, worldviews, values, and ideology into coherent theoretical frameworks (Duckitt, & Sibley, 2010; Radkiewicz, 2016; Dietz, Dan, & Shwom, 2007; Jost, Glaser, Kruglanski, & Sulloway, 2003). Despite those theoretical uncertainties, the most convincing approaches seems to highlight values and psychological predispositions (Malka, Lelkes, & Soto, 2019; Carmines, & D'Amico, 2015; Gerber, Huber, Doherty, Dowling, & Ha, 2010) as one of the main predictors of ideology. Indeed, growing evidence from political psychology emphasizes the dispositional foundations of individuals ideology structuring (Adorno, Frenkel-Brunswick, Levinson, & Sanford, 2019; Jost et al., 2003; Jost, 2006; Duckitt, & Sibley, 2010).

Those foundations have been theorized as two-dimensional by several scholars (Duckitt and Sibley, 2010; Schwartz, Caprara, Vecchione, Bain, Bianchi, Caprara, Cieciuch, et al. 2014). Two different patterns of causes of ideological structuring are widely discussed and used in the existing literature, Right-Wing Authoritarianism (RWA) (Altemeyer, 1981) alongside Social Domination Orientation (SDO) (Pratto, Sidanius, Stallworth, and Malle, 1994) on one hand, and basic human values with a self-enhancement/self-transcendence line and a conservation/openness-to-change one (Schwartz, 1994) on the other. Both those conceptualizations yet similarly encapsulate one dimension which can be related to egalitarian, or socioeconomic left-right, predispositions and one relating to more cultural and societal ones. Indeed, both self-transcendence vs. self-enhancement and SDO encapsulates how supportive, or tolerant, one is of between-groups inequalities and his or her will to see them corrected (Swhartz, 1994, Pratto et al., 1994). Differently, both openness to change vs. conservation and RWA points to an individual preference for authority, social order, and conformity (Altemeyer, 1981, Schwartz, 1994).

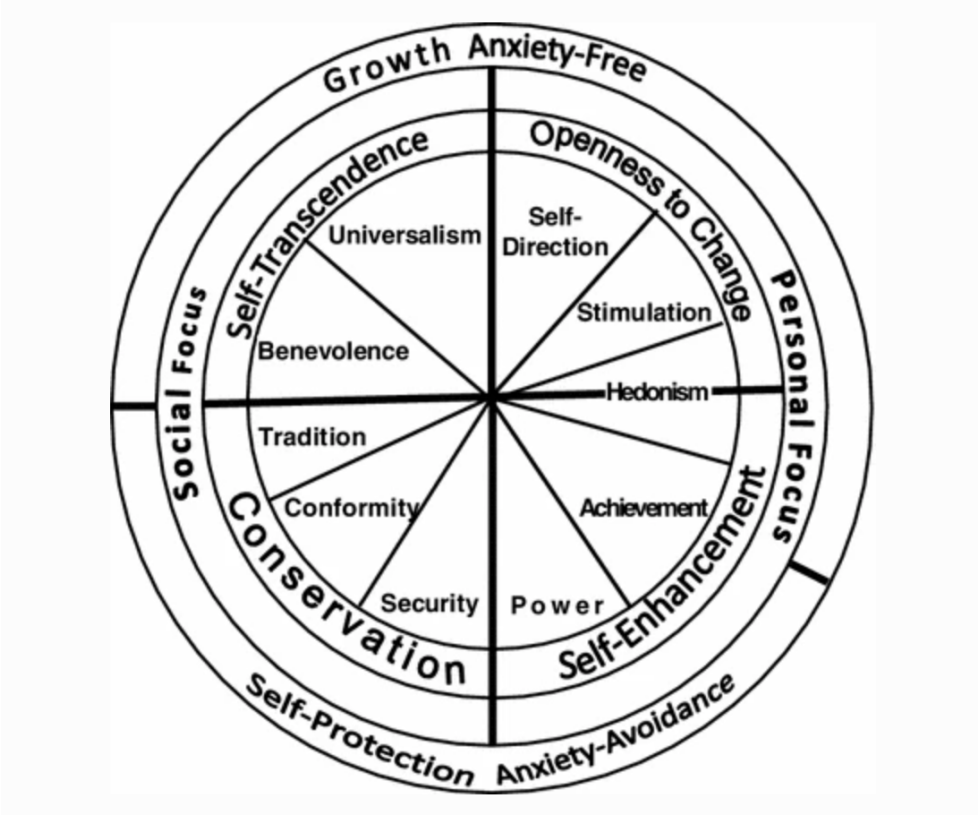
Despite their similarity, this thesis will mostly focus on basic human values for two reasons. First, there are debates over RWA and SDO regarding their nature as some argue they are socio-psychological causes of ideology (Altemeyer, 1981; Pratto et al., 1994; Radkiewicz,

2016) while others consider them as ideological attitudes in themselves (Duckitt, & Sibley, 2010). Secondly, due to their abstractness, basic human values are arguably rooted deeper in individuals' identities and evaluation processes, therefore limiting the number of potential confounding or descendant variables.

Basic human values are defined as "(1) concepts or beliefs, (2) pertain to desirable end states or behaviors, (3) transcend specific situations, (4) guide selection or evaluation of behavior and events, and (5) are ordered by relative importance" (p. 4, Schwartz, 1992). They are as well considered universal, motivational, as well as differently hierarchically ordered (Schwartz, 1992). While they may seem too abstract to relate to political attitudes, they appear to be substantially connected to political values and even larger drivers of political values than age, gender, education, and income (Schwartz, Caprara, Vecchione, Bain, Bianchi, Caprara, Cieciuch, et al. 2014). Ten basic human values have been identified by Schwartz (1994) (Figure 1) which can be combined to form four broader value orientations. While Power, Achievement, and Hedonism form self-enhancement values, Benevolence and Universalism form self-enhancement values. The former relates to values focused on the individual in a perceived threatening environment, leading to survival for the fittest beliefs and the latter is focused on the community in a perceived cooperative environment. On the other hand, Tradition, conformity, and security forms the value-tryptic of conservation values while Stimulation and Self-direction forms openness to change values. The former focusing on survival and the repression of threats as a group, community while the latter focuses on individual expression in a free, autonomous, and explorative way. Each orientation conflicts with another, self-transcendence with self-enhancement and openness to change with conservation.

As mentioned above, basic human values will be used as the foundations of ideology and ordered through two dimensions, one socioeconomic and one cultural.

Figure 1. Circular ordering of basic human values with two dimensions



Source: Schwartz (1994)

For the socioeconomic dimension, an axis is created with two polar types of values, self-transcendence values on one extreme and self-enhancement values on the other. Self-transcendence values are composed of preference for universalist and benevolent actions (Schwartz, 1994), therefore actions embodying welfare protection, empathy, and caring for our relatives. On the other side, self-enhancement values are composed of power, achievement, and hedonism, which entails behaviors oriented towards control over others, success, recognition, and self-gratification (Schwartz, 1994). These two can theoretically be associated with an individual propensity to favor policies embodying egalitarianism or, on the opposite, economic libertarianism. Quite similarly to traditional left-right lines, one can expect individuals with more self-transcendent values to exhibit greater acceptability for a carbon tax as taxes entail, at least in theory, redistribution and as it may mean greater protection of all individuals through reduced GHG emissions, especially the most vulnerable ones which are the hardest hit by

climate change (Levy, & Patz, 2015). On the other hand, individuals with self-enhancement values might see it as an additional obstacle to individual success, a non-recognition of their merit, and a control of the state over them. Yet, it is likely that the effect of self-transcendent values will be slightly weaken due to the regressive nature of carbon taxes which increases overall prices irrespectively of one's level of income, and due to European carbon taxes not including tax-revenue recycling through the form of direct refund for poorest households (Farrell, 2017). These theoretical considerations lead to the following hypothesis:

H2: Individuals giving more priority to self-transcendence values will express higher acceptability for a carbon tax than individuals favoring self-enhancement values.

Regarding the cultural dimension, another axis, orthogonal to the other one, is constructed with openness to change values in one extreme and conservation values on the other. Openness to change orientation is associated with individuals more prone to act or favor behaviors defined by self-direction and stimulation, that is, seeking novelty and challenge in life, living out one's 'comfort zone' through independent thinking and choices (Schwartz, 1994). Differently, conservation group of values are associated with preferences for tradition, conformity, and security. These cultural preferences lines can theoretically be associated with varying levels of acceptability for a carbon tax. Indeed, one might expect individuals with more openness to change values to better tolerate changes in their environment, ones that question the status quo. Differently, individuals with more conservation values express lower acceptability for a carbon tax, since (1) climate change is often seen as a liberal and cosmopolitan political elite agenda (Lockwood, 2018), which (2) mostly benefit individuals outside of the group — developing countries are the hardest hit by climate change (IPCC, 2021), and (3) for which the required policies are seen as threats to the existing social order and 'traditional' ways of living (Weko, 2021). Indeed, taking climate change seriously politically may entail drastic paradigmatic shifts which more conservative individuals might not be willing

to undertake. As well, the criticisms of past ways of organizing society and the economy due to their effect on the climate may not be well accepted by individuals defending norms, conformity, and traditions. Therefore, the following relationship is expected to hold:

H3: Individuals giving more priority to openness to change values will express higher acceptability for a carbon tax than individuals favoring conservation values.

Research Design

Data

The Round 8 of the European Social Survey (2016) due to its modules on Public Attitudes to Climate Change, Energy Security, and Energy Preferences will be used. The survey uses random probability sampling with a 70% minimum response rate for each country, one-hour face-to-face interviews, and covers 23 countries (n= 44,387). Three reasons explain the use of this survey. Firstly, a cross-country analysis directly answers one of the motives of this paper, namely increased generalizability of previous findings through a replication-type of study beyond one-country analyses. Secondly, the ESS-8 (2016) provides more convenient data accessibility as it includes indicators of socio-economic attitudes, cultural preferences, self-interest, carbon tax acceptability and all the necessary control variables. Thirdly, carbon tax debates in Europe are more salient than in the rest of the world, especially non-Western countries, and the implementation of carbon taxes is more generalized (Worldbank, 2022). One consequence of this choice is the potential larger ideological constraint along left-right lines in Western-Europe (Malka, Lelkes, & Soto, 2019) leading to larger correlations between the socioeconomic and cultural dimensions. Yet, this is not an issue as the survey covers many post-communist countries, as all West-European citizens are not equally politically engaged, and as the two ideological dimensions will most likely not have the same effect on carbon tax acceptability.

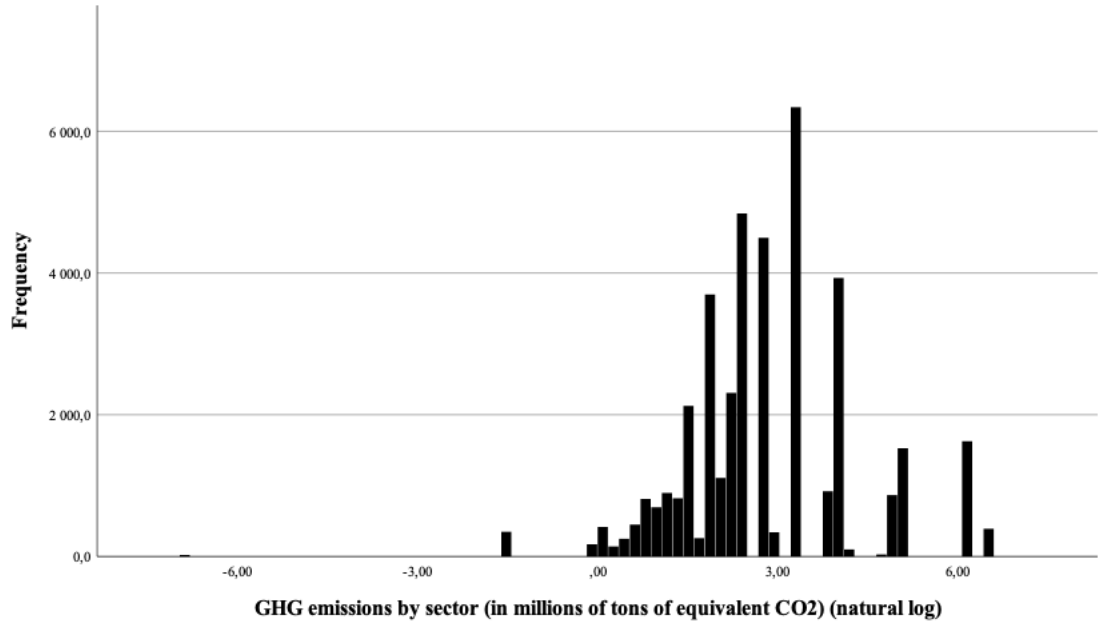
Dependent variable

This paper will use the concept of acceptability that is a "favorable or unfavorable evaluation of a policy before implementation" (Dreyer, Teisl, & McCoy, 2015 p. 66) applied to a carbon tax. The ESS-8 (2016) has the following indicator of carbon tax acceptability: "to what extent are you in favor or against the following policies in [country] to reduce climate change? Increasing taxes on fossil fuels, such as oil, gas, and coal." It has a five-point scale measurement from "strongly against" (=1) to "strongly in favor" (=5) with a mean of 2.23 (standard deviation: 1,23). It has a minimum of 2.34 in Poland a maximum of 3.48 in Sweden, the range roughly equaling one standard deviation. The scale is reversed compared to the original dataset so that higher values mean higher acceptability. This item possesses the two components that Kyselá, Ščasný, and Zvěřinová (2019) attach to acceptability: passive evaluation and 'ex ante' or hypothetical evaluation. Yet, this implies a possibility for larger levels of positive evaluations, compared to support, since neither a behavioral element, nor an existing policy are attached to acceptability (Dreyer, Teisl, & McCoy, 2013).

Independent variables

Regarding self-interest, the job-sector of the respondent will be operationalized via an ESS-8 (2016) indicator based on the NACE Rev. 2 (Eurostat, 2008) — statistical classification of economic activities used in the EU (99 categories). The survey item is the following: "What does/did the firm/organisation you work/worked for mainly make or do?". Using Eurostat Data Browser (2022), a customed dataset of green-house gases (GHG) emissions by NACE Rev. 2 job-sector classification (Appendix A) has been created. Even though Eurostat (202) also uses the NACE Rev. 2 in their Data Browser, they pooled some of its categories together leading to 64 categories instead of the 99 from the ESS-8 (2016). The ESS-8 dataset has therefore been recoded to obtain the same 64 categories as Eurostat and to facilitate the merger of the Eurostat customed dataset in the ESS-8 dataset. Since GHG emissions by sector ranges from 1,361 to

Figure 2. GHG emissions by sector NACE Rev. 2 (in million tons of CO2 equivalent) (natural log)



718,887 million tons of GHG emissions, a standardized variable (natural logarithm of the initial variable) will be used to improve the interpretability of the coefficients, therefore individuals working in sectors with above average levels of GHG emissions will have positive values. The natural logarithmic of this variable has a mean of 2.8 (standard deviation: 1.43). A descriptive view of this variable's values is provided in Figure 2. The most represented category is "Retail trade, except of motor vehicles and motorcycles" with a natural logarithmic value of 3.38. We can observe that most values fall between 0 and 3, that is, slightly above the average GHG emissions by sector.

As for ideology, the ESS-8 (2016) possesses 21 questions relating to basic human values. Figure 3 helps to explain the variables construct. Between two and three questions are used to create (mean of the questions) each of the ten basic human values (Power, Achievement, Hedonism, Stimulation, Self-Direction, Universalism, Benevolence, Tradition, Conformity, Security). These ten basic human values were then assembled (mean of basic human values) to

Table 1. Basic human values variables construct

ESS-8 Survey Questions	Basic Human Values (= mean of questions)	Value orientations (= mean of basic human values)	Value dimensions (= mean of value orientations)
V12_reversed **V18_reversed**	Benevolence	Self-transcendence	Self-transcendence vs. Self-enhancement
V3_reversed **V8_reversed** **V19_reversed**	Universalism		
V10 **V21**	Hedonism	Self-enhancement	
V4 **V13**	Achievement		
V2 **V17**	Security		
V1_reversed **V11_reversed**	Self-direction	Openness to change	Openness to change vs. Conservation
V6_reversed **V15_reversed**	Stimulation		
V7 **V16**	Conformity	Conservation	
V9 **V20**	Tradition		
V5 **V14**	Security		

Note: 'Reversed' means that the scale from 0 to 6 was reversed. High scores therefore mean higher identification than lower scores — instead of the opposite for non-reversed questions. Each value dimension is a mean of one reversed and one non-reversed value orientation. 6 meaning high identification for both self-transcendence and openness to change orientations, while 1 means high identification for both self-enhancement and conservation orientations.

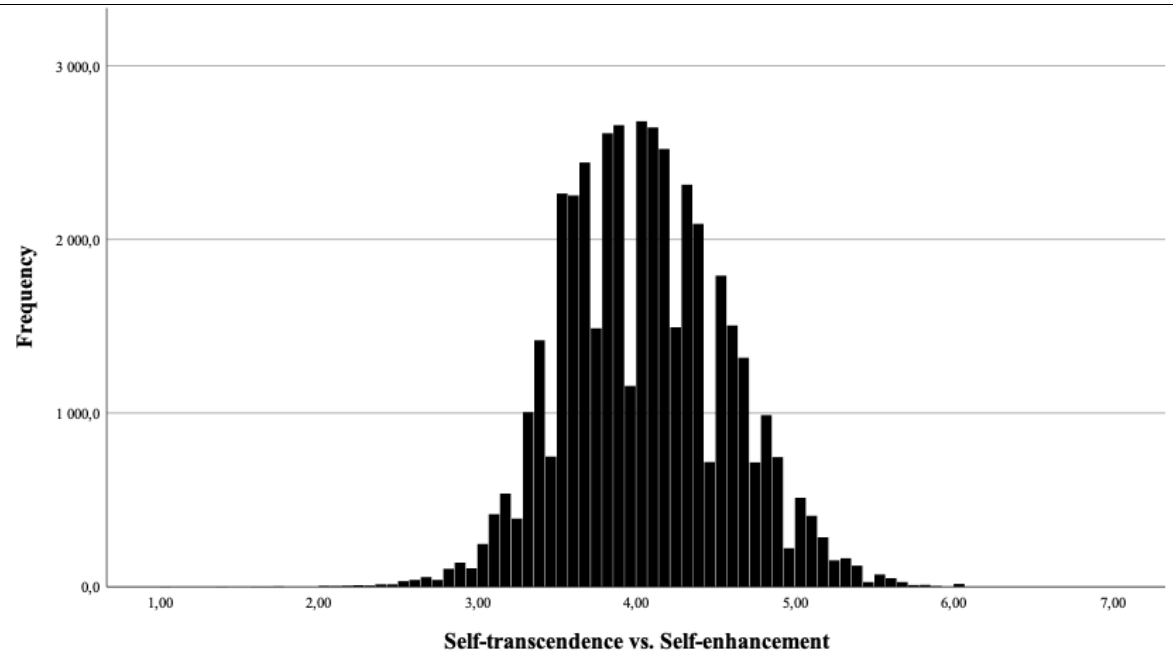
form the four value orientations (self-transcendence, self-enhancement, openness to change, conservation). Only questions relating to self-transcendence (Universalism, Benevolence) and openness-to-change (Stimulation, Self-Direction) were reversed to range from "not at all like me" (=1) to "totally like me" (=6), while questions for self-enhancement (Power, Achievement,

Hedonism) and conservation (Tradition, Conformity, Security) values remained as "totally like me" (=1) and "not at all like me" (=6). Reversing the questions of those two groups of values enabled me to create two value dimensions. Since self-enhancement values are theoretically opposed to self-transcendence ones and similarly for conservation and openness to change values, we expect individuals with high identification to self-transcendence values (= 6, "totally like me", once reversed) to have low identification to self-enhancement values (= 6, "not at all like me") and individuals with high identification to openness to change values (= 6, "totally like me", once reversed) to have low identification to conservation values as well (= 6, "not at all like me").

This manipulation therefore enables us to create two variables, or axes — 'self-transcendence vs. self-enhancement' (M = 4.05, SD = 0.52, Figure 3) and 'openness to change vs. conservation' variable (M = 3.38, SD = 0.59, Figure 4). Individuals with high identification with self-transcendence or openness to change (=6) orientations and very low identification with self-enhancement or conservation (=6) ones will have higher scores on these scales than respondents identifying somewhat with both self-transcendence or openness to change (=3) and self-enhancement or conservation (=3), and ones identifying with self-enhancement or conservation (=1) orientations more than self-transcendence or openness to change ones (=1). In contrary, respondents scoring low on both 'self-transcendence vs. self-enhancement' and 'openness to change vs. conservation' identify more with self-enhancement and conservation orientations.

The distribution of those two variables (Figure 3 and 4) possesses a somewhat normal shape which can be explained by their computation. They are indeed the fruit of three successive mean calculations (means of questions to values, means of values to value orientations, means of value orientations to value-dimensions). These successive mean computations logically

Figure 3. 'Self-transcendence vs. self-enhancement' values distribution



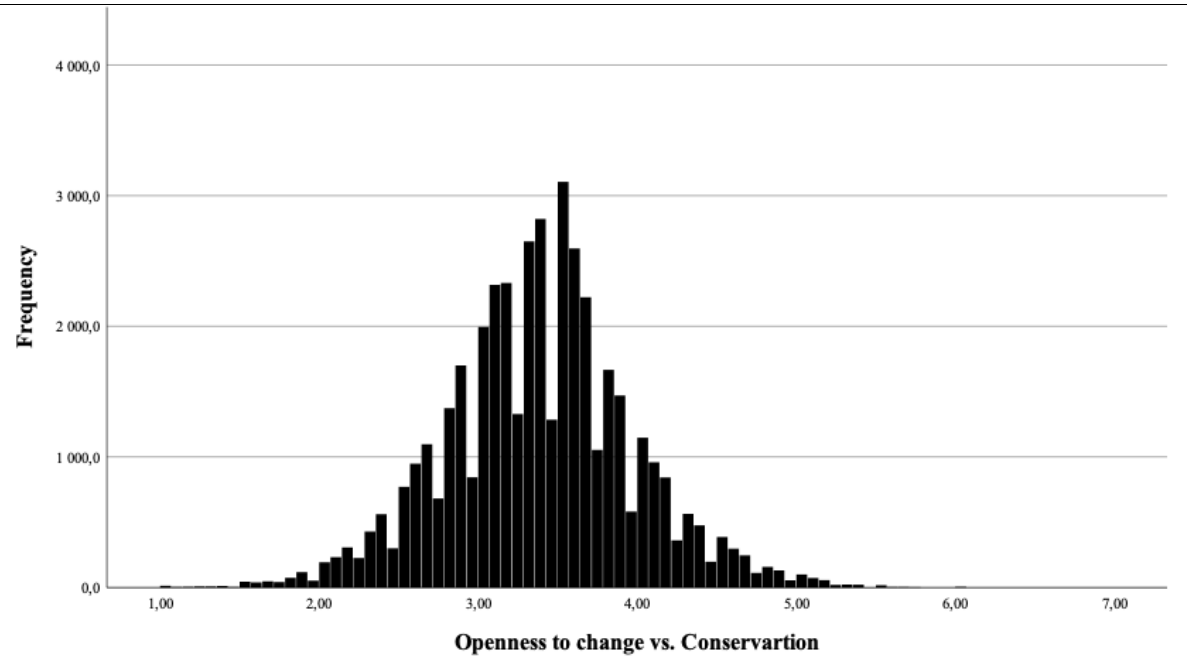
Note: Higher values mean more identification with self-transcendence values.

heavily reduce the standard deviation of the two created variables and is the likely reason behind the low Alpha Cronbach values obtained (around 0.55 for the two). A different model with the four individual value orientations will therefore be ran as well.

Control variables and statistical test

Several control variables are included in the final multivariate model with conventional sociodemographic variables such as age, gender, education, and the place of living which might all impact both the job-sector and ideology. Income was not included to avoid multicollinearity since income is directly impacted by one's job-sector. Additionally, level of interest in politics and trust in the parliament were included in the final model. Indeed, interest in politics might impact one's capacity to frame politically one's basic human values and trust in national political institutions has proved to be an important driver of support, or lack thereof, for carbon

Figure 4. 'Openness to change vs. conservation' values distribution



Note: Higher values mean more identification with openness to change values.

taxes (Umit, & Schaffer, 2020; Baranzini, & Carattini, 2017).[1]

This thesis dependent variable will be treated as continuous, despite being ordinal, to improve the interpretability of the results. Additionally, the cases being nested by country in the ESS-8 dataset (2016), this thesis will use a complex samples general linear model, which reduces country-fixed effects via stratification, clustered, and multilevel sampling by country.

Before diving into the results section, linear regressions assumptions were checked and no violations of linearity, normality, homoscedasticity, and multicollinearity were detected. Most measures to identify outliers and influential cases had values ranging inside conventional thresholds. Nevertheless, around two percent of the valid cases had problematic leverage values — more than three times the leverage values mean (see Appendix C, Table C.3 and C.4). Only minute differences were observed when running the model without those cases with a maximum of 0.03 difference (for the intercept) in estimated coefficients. Those cases have therefore not

[1] More information regarding the control variables can be find in Appendix B.

Table 2. Spearman's Rho correlation among acceptability for a carbon tax, GHG emissions by job-sector, socioeconomic ideological dimension, and cultural ideological dimension

	1	2	3	4
1. Acceptability for a carbon tax	–			
2. Levels of GHG emissions by sector	– 0.060**	–		
3. Self-transcendence vs. Self-enhancement values	0.034**	– 0.038**	–	
4. Openness to change vs. Conservation values	0.119**	– 0.074**	–0.230**	–

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

been excluded for the analysis.[2]

Results

First of all, and according to Hypothesis 1, an examination of Table 2 seems to provide preliminary evidence of the expected pattern as the respondent's job-sector level of GHG emissions and acceptability for a carbon tax appears to have a negative relationship. The bivariate correlation between these two ($R = -0.06$, $p < 0.01$) means that higher levels of GHG emissions of the respondent's job-sector are associated with decreased acceptability of a carbon tax.

Moving toward the multivariate analysis, Table 3 provides an overview of the complex sample linear regression analysis, with and without control variables. In accordance with Hypothesis 1, we can observe that a 1% increase in the respondent's job-sector GHG emissions (in millions of tons) leads to a 0.00019 decrease in acceptability for a carbon tax ($\beta = – 0.019$,

[2] For more details on linear regression analysis assumptions checks, see Appendix C

Table 3. Complex sample linear regression models – summary results

	Model 1	**Model 2**
(Constant)	1.624***	1.702***
	(.0163)	(.179)
GHG emissions by sector (natural log)	-.046***	-.019
	(.010)	(.010)
Self-transcendence vs self-enhancement	.100***	.098***
	(.027)	(.028)
Openness to change vs Conservation	.240***	.166***
	(.025)	(.026)
Interest in Politics (1)		.017**
		(.033)
Interest in Politics (3)		-.92***
		(.027)
Interest in Politics (4)		–.197***
		(.037)
Trust in national parliament		.061***
		(.006)
Age		-.004***
		(.001)
Gender		.065**
		(.025)
Education (1)		-.080
		(.056)
Education (2)		-.035
		(.049)
Education (3)		-.008
		(0.048)
Education (5)		.045
		(.044)
Education (6)		.193***
		(.049)
Education (7)		.219***
		(.047)
Domicile type (1)		.087*
		(.040)
Domicile type (2)		.109*
		(.049)
Domicile type (3)		-.077*
		(.040)

Domicile type (5)		-.112 (.071)
Number of observations	38 090	37 381
R-Square	0.019	0.064

Note: Complex sample linear regression coefficients with standard errors in brackets. Estimated effects of individuals' job-sector levels of GHG emissions (natural log), level of self-transcendence vs. self-enhancement values, level of openness to change vs. conservation values, interest in politics, trust in national parliament, age, gender, highest level of education, and domicile type on their acceptability for a carbon tax.
***p < 0.001, **p < 0.01, *p < 0.05

p = 0.054) (University of Virginia Library, 2018). We can observe that the inclusion of the control variables reduced by more than two the size of the coefficient and made the effect of this variable statistically insignificant, even though it remains very close to the 95% confidence interval threshold. Maintaining all other values constant, going from 3,343 (10^{th} percentile) to 140,883 (90^{th} percentile) million tons of GHG emissions for a respondent's job-sector — a 4 149% increase — imply an expected decrease of 0.0309 in acceptability for a carbon tax (5 points-scale). This is very small as it represents less than a 1% decrease based on acceptability of a carbon tax's scale (1-5). A different model with a dichotomized version of GHG emissions levels by job-sector has been used as a test in a similar fashion as Bechtel, Genovese, & Scheve, (2020), yet the obtained estimate was not substantially larger ($\beta = -0.048$, $p < 0.05$, Appendix D1)

Regarding ideology, operationalized through basic human values, 'self-transcendence' vs, self-enhancement' values' variable has a positive monotonous relationship with acceptability for a carbon tax (Spearman's rho = 0,034, $p < 0.01$) as attested by Table 2. 'Openness to change' vs. 'Conservation' values' variable also has a positive monotonous association with carbon tax acceptability (Spearman's rho = 0.119, $p < 0.01$) as shown by Table 2. Therefore, higher levels of self-transcendence and openness-to-change values are associated with greater acceptability while higher levels of self-enhancement and conservation are associated with lower acceptability for a carbon tax.

Based on Model 2 (Table 3) 'self-transcendence' vs. 'self-enhancement' has a positive and statistically significant coefficient ($\beta = 0.098$, $p < 0.001$) which means that more self-transcendentalist individuals are expected to be more supportive of a carbon tax, confirming Hypothesis 2. Maintaining other variables constant, going from the most self-enhancement-oriented individuals (=1) to the most self-transcendence-oriented ones (=6) implies an expected increase of a half scale-point (acceptability of a carbon tax ranges from 1 to 5) which is non-negligible as it represents 40% of the standard deviation of acceptability for a carbon tax. The cultural ideological dimension, structured with 'openness to change' and 'conservation' in each pole, exhibit directional patterns in accordance with Hypothesis 3. Indeed, 'openness to change' vs. 'Conservation' has a positive and statistically significant coefficient ($\beta = 0.166$, $p < 0.001$) which means that higher levels of 'openness to change' values are expected to lead to higher levels of carbon tax acceptability. Going from the higher levels of 'conservation' values (=1) to higher levels of 'openness to change' values (=6) lead to an expected increase of 0.83 on carbon tax acceptability, representing 17% of the dependent variable's range, and 70% of its standard deviation.

It should be mentioned that both ideological measurement constructs had rather low reliability values (Alpha Cronbach = 0.55) which is expected to increase measurement error and reduce the ability of finding statistically significant results. Nevertheless, the fact that the estimates are all highly statistically significant, and that the two dimensions do not measure one concept per se, but two opposite ones greatly reduce reliability concerns. As well, a model was ran replacing the two ideological constructs with the four value orientations individually (which all had Alpha Cronbach values above 0.7) and the obtained estimates were not diverging greatly from the ones of Model 2 (Appendix D2). Only self-enhancement and openness-to-change were not statistically significant. Yet self-enhancement and openness to change orientations being

considered polar orientations from self-transcendence and conservation ones respectively, this was not entirely unexpected.

Turning to control variables, while age has a negative and statistically significant coefficient ($\beta = -0.004$, $p < 0.001$), younger people being most likely more supportive of climate policies in general, gender has statistically significant positive direction, males being more supportive of a carbon tax ($\beta = 0.065$, $p = 0.176$). As well, both lower interest in politics and lower trust in the national parliament are associated with lower acceptability for a carbon tax. The dichotomous variable for education seems to show that intermediary levels of education from "lower secondary" to "advanced vocational, sub-degree" are not expected to diverge substantially regarding carbon tax acceptability. Larger differences occur for the lowest education category "less than lower secondary" which has a negative statistically significant coefficient ($\beta = -0.159$, $p < 0.01$), and for the two higher levels of education "BA level" ($\beta = 0.250$, $p < 0.001$) and "Master level or more" ($\beta = 0.278$, $p < 0.001$) which both have positive coefficients. Finally, and similarly to previous research (Umit & Schaffer, 2020; Arndt, Halikiopoulou & Vrakopoulos, 2022; Rhodes, Axsen & Jaccard, 2017), the Model 2 shows that the more urban an individual is, the more likely that person is to have greater acceptability for a carbon tax.

Discussion

The question this thesis tried to answer to is the following: "to what extent does the GHG emissions level of a job-sector and two-dimensional ideology impact public acceptability for a carbon tax?". While previous studies provided some evidence of the effect of self-interest and ideology on the acceptability for a carbon tax, new measures were explored here.

While impactful in other contexts (Dancygier & Donnelly, 2012; Malhotra, Margalit & Mo, 2013; Bechtel, Genovese, & Scheve, 2020), self-interest operationalized through an

occupation-centered measure — here the level of GHG emissions of the respondent's job-sector — did not provide robust results as the inclusion of control variables greatly reduced its statistical significance ($p = 0.054$ in Model 2). In addition, consequent effect size changes occurred (0.025 on a five-point scale). While these are arguably small in absolute terms, they do represent half the effect size of this variable without controls (Model 1). Since the results are still very close to the 95% confidence interval threshold, and that the direction of the coefficient is accurate with our theory, Hypothesis 1 — higher levels of GHG emissions of the respondent's job sector are expected to decrease acceptability for a carbon tax — can be assumed to hold despite a need for further evidence.

The very small effect of self-interest operationalized via the GHG emissions of the respondent's job-sector and its statistically insignificant effect ($p = 0.054$) are puzzling since a carbon tax can have drastic adverse effects on employment in carbon-intensive sectors (Yamazaki, 2017) and as it was found to be statistically significant and twice as large in previous research (Bechtel, Genovese, & Scheve, 2020) — yet the estimate in Bechtel, Genovese, and Scheve (2020) study was only slightly larger in comparison to the estimate of the dichotomous version of this variable (Appendix D1). Several hypotheses can explain those results. First, respondents might be poorly informed regarding the levels of carbon emissions of their job-sector, therefore limiting the inclusion of this parameter in costs-benefits calculations. Second, they might be informed, but the costs of a carbon tax are not explicit and short-term enough to be integrated properly in rational calculations. Third, restrictive, tax-based, climate policies being still scarce, one's capacity to understand the effects of such tools can therefore be reduced. Fourth, while being high-emitting sectors, some of them are nevertheless highly essential (water transport, sewerage, waste management, remediation activities, gas and electricity supply) thus creating a sensation of job-security, therefore limiting

the fears of job-loss or wage cut due to a carbon tax. This would reduce the effect of this variable since several of the most-emitting sectors in the dataset could be considered of this nature.

As for ideology, its operationalization through two dimensions, one socioeconomic, and one cultural, provided robust results regarding acceptability for a carbon tax with substantial expected size effects. These confirmed both Hypothesis 2 and 3 — individuals giving more priority to self-transcendence (openness to change) values will express higher acceptability for a carbon tax than individuals favoring self-enhancement (conservation) values.

Rather interestingly, we can observe that the cultural ideological dimension ('conservation' vs. 'openness to change') is more impactful than the socio-economic one ('self-enhancement' vs. 'self-transcendence'). Despite having chosen a climate policy with a strong economic dimension (i.e., a carbon tax), which likely increased the effect of socioeconomic considerations when evaluating this policy, cultural ideological predispositions still seem to prevail. This is line with many new-cleavage theory proponents who emphasized the evolution of the cultural dimension from religious considerations to matters of individual freedoms and environmental issues (Hooghe, & Marks, 2018; Kriesi, 2010; Inglehart, 1977; Bornschier, 2010), therefore placing climate change concerns and preferences predominantly in the realm of cultural attitudes.

Another model replacing the basic human values with a left-right self-placement measure was ran and the expected effect size was considerably lower (Appendix D3). Therefore, both the lower explanatory power of left-right self-placement measures (Appendix D3) and the observed differentiated effects of the two theorized dimensions provide further evidence for the need to go beyond unidimensional left-right operationalization of ideology, and to conceptualize it with, at least, two dimensions.

Despite the validity of the obtained results, this thesis possessed three important limitations. First, the operationalization of the job-sector levels of GHG emissions was heavily

quantitative and based on the raw numbers of emissions (in millions of tons), which prevented more qualitative considerations regarding which sectors are public or 'essential' which would decrease the fear of job-loss, if the respondent had a general idea of how pollutive the sector he or she works for is, and the job-sector capacity of decarbonation in the next decade or two. These are possible improvement pathways for further research on self-interest and acceptability for a carbon tax. Second, the two value-dimensions of ideology had a low Alpha Cronbach reliability value which raises reliability concerns. Even though these are slightly mitigated by the statistical significance of the estimates and by the replacement of the two dimensions with the four value orientations individually bringing almost similar results, further research should strive to improve the reliability of ideological constructs in relation with acceptability for a carbon tax. This could be done by maintaining two dimensions for ideology but replacing human values with right-wing authoritarianism (Altmeyer, 1981) and social dominance orientations (Pratto, Sidanius, Stallworth, and Malle, 1994) as the two dimensions, or other similar concepts pertaining to one socioeconomic and one cultural dimension. Third, the results are heavily exploratory and flatten any across-European region differences. While it was beyond the scope of this thesis, further research should strive to apply the two-dimensional operationalization of ideology in country or region-specific analyses to understand different patterns, or different size effects between the importance of each dimension for acceptability of a carbon tax, and more broadly for any climate policy.

All those results yield important policy implications regarding the implementation of carbon tax or the increase in their prices. The levels of GHG emissions of the respondent's job sector have, despite almost achieving statistical significance, an expected negative effect on acceptability. Respondents thus appeared sensitive to the consequences of such a policy in their employment security and prospect. Therefore, when introducing a carbon tax, or increasing its price, national governments should incorporate employment matters in their discourse and find

ways to facilitate the professional retraining of this policy's 'losers' — those working in high-emitting sectors. The creation of 'green jobs' (ILO, 2016) guaranteed by the state is one policy-solution among others.

The obtained results for ideology have equal if not greater political implications. Indeed, the fact that cultural considerations are larger than socioeconomic ones incentivizes us to understand the needs of individuals prioritizing conservation orientations (Security, Conformity, Tradition). There seems to be a conflict between the preservation of past ways of organizing the society satisfying conservation orientation-leaning individuals, and the fact that those structures led to the current environmental crisis which would therefore call for paradigmatic societal changes. According to Lockwood (2018), individuals resisting globalization are most likely the same resisting climate change policies as both processes strongly shake the cultural roots on which society stands. The whole challenge of policymakers is to accommodate security-seeking individuals in times of rapid political, economic, and cultural shifts.

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Appendices

Appendix A – GHG emissions by NACE Revision 2 sectors

Table. A.1. Eurostat Data Browser: Air emissions accounts by NACE Rev. 2 sectors (customed)

AIRPOL (Labels)	**Greenhouse gases (CO2, N2O in CO2 equivalent, CH4 in CO2 equivalent, HFC in CO2 equivalent, PFC in CO2 equivalent, SF6 in CO2 equivalent, NF3 in CO2 equivalent)**
NACE_R2 (Labels)	
Total - all NACE activities	2 810 332 080,55
Crop and animal production, hunting and related service activities	470 188 978,5
Forestry and logging	4 702 124,87
Fishing and aquaculture	6 403 958,62
Mining and quarrying	49 758 354,71
Manufacture of food products; beverages and tobacco products	60 786 104,16
Manufacture of textiles, wearing apparel, leather and related products	6 267 122,23
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	4 391 166,1
Manufacture of paper and paper products	29 447 040,32
Printing and reproduction of recorded media	2 433 347,29
Manufacture of coke and refined petroleum products	116 057 388,37

Manufacture of chemicals and chemical products	144 110 938,45
Manufacture of basic pharmaceutical products and pharmaceutical preparations	6 850 177,6
Manufacture of rubber and plastic products	8 801 390,07
Manufacture of other non-metallic mineral products	176 194 894,68
Manufacture of basic metals	140 883 138,46
Manufacture of fabricated metal products, except machinery and equipment	11 332 788,29
Manufacture of computer, electronic and optical products	3 343 085,88
Manufacture of electrical equipment	3 627 495,49
Manufacture of machinery and equipment n.e.c.	9 212 659,24
Manufacture of motor vehicles, trailers and semi-trailers	8 287 973,06
Manufacture of other transport equipment	1 679 517,26
Manufacture of furniture; other manufacturing	3 315 514,55
Repair and installation of machinery and equipment	2 549 316,8
Electricity, gas, steam and air conditioning supply	718 886 514,01
Water collection, treatment, and supply	6 464 706,05
Sewerage, waste management, remediation activities	141 595 963,4
Construction	52 680 321,96
Wholesale and retail trade and repair of motor vehicles and motorcycles	10 925 706,14
Wholesale trade, except of motor vehicles and motorcycles	43 252 991,95
Retail trade, except of motor vehicles and motorcycles	29 420 713,79
Land transport and transport via pipelines	159 208 529,44

Water transport	125 268 728,09
Air transport	71 436 924,84
Warehousing and support activities for transportation	20 753 349,53
Postal and courier activities	6 117 646,04
Accommodation and food service activities	15 821 152,89
Publishing activities	1 074 927,39
Motion picture, video, television programme production; programming and broadcasting activities	1 545 194,82
Telecommunications	2 146 976,09
Computer programming, consultancy, and information service activities	3 597 267,37
Financial service activities, except insurance and pension funding	4 438 503,28
Insurance, reinsurance and pension funding, except compulsory social security	1 013 401,22
Activities auxiliary to financial services and insurance activities	1 257 434,95
Real estate activities	5 429 742,49
Legal and accounting activities; activities of head offices; management consultancy activities	8 154 914,76
Architectural and engineering activities; technical testing and analysis	4 194 543,02
Scientific research and development	2 056 450,99
Advertising and market research	1 733 961,74
Other professional, scientific and technical activities; veterinary activities	1 938 793,37
Rental and leasing activities	7 670 050,99
Employment activities	2 361 428,91

Travel agency, tour operator and other reservation service and related activities	880 886,94
Security and investigation, service and landscape, office administrative and support activities	6 949 342,22
Public administration and defence; compulsory social security	26 652 172,13
Education	11 459 300,65
Human health activities	14 695 342,79
Residential care activities and social work activities without accommodation	9 442 168,9
Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities	2 916 409,3
Sports activities and amusement and recreation activities	4 316 076,98
Activities of membership organizations	4 770 301, 34
Repair of computers and personal and household goods	991 671, 7
Other personal service activities	5 982 428, 11
Activities of households as employers; undifferentiated goods- and services- producing activities of private households for own use	203 303, 67
Activities of extraterritorial organizations and bodies	1361, 31

Appendix B – Values of control variables

Table B.1. Values of control variables

Control variables	Values
Age	15 to 100 (years)
Gender	0 = 'Female' (mode) 1 = 'Male'
Interest in politics	1 = 'Very interested' 2 = 'Quite interested' (mode) 3 = 'Hardly interested' 4 = 'Not at all interested'
Trust in national parliament	0 = 'No trust at all' 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 6 = 6 7 = 7 8 = 8 9 = 9 10 = 'Complete trust'
Highest level of education	1 = 'ES-ISCED I , less than lower secondary' 2 = 'ES-ISCED II, lower secondary' 3 = 'ES-ISCED IIIb, lower tier upper secondary' 4 = 'ES-ISCED IIIa, upper tier upper secondary' (mode) 5 = 'ES-ISCED IV, advanced vocational, sub-degree' 6 = 'ES-ISCED V1, lower tertiary education, BA level' 7 = 'ES-ISCED V2, higher tertiary education, >= MA level'
Place of living	1 = 'A big city' 2 = 'Suburbs or outskirts of big city'

	3 = ‘Town or small city’ 4 = ‘Country village’ (mode) 5 = ‘Farm or home in countryside’

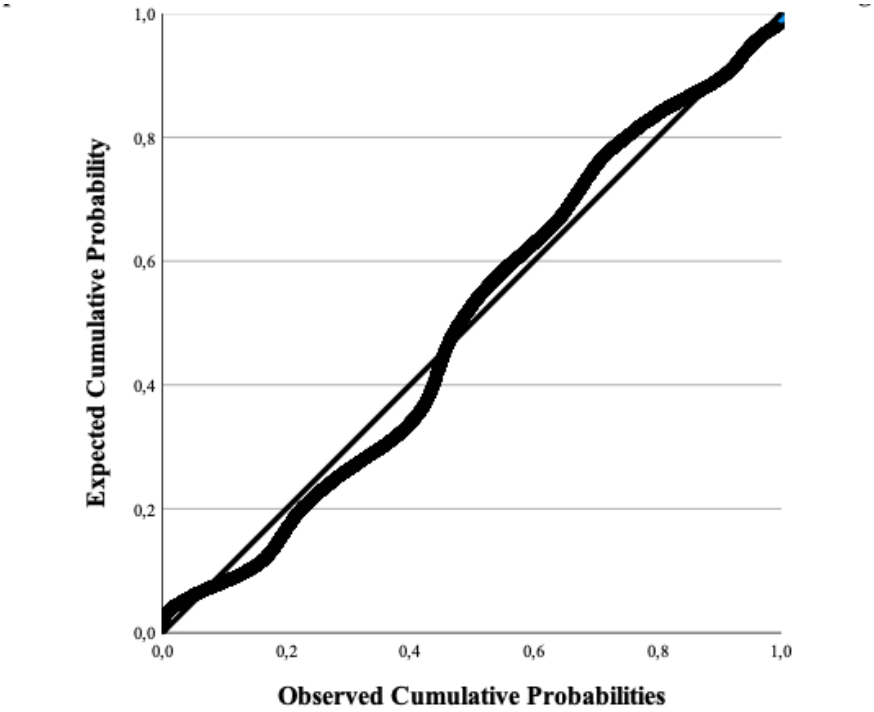
Appendix C – Linear regression analysis assumptions

1. Assumption of continuity

While the dependent variable (public acceptability for a carbon tax) is an ordinal variable (5-point scale), it will be considered as continuous for the analysis both for statistical manipulation reasons and for improved coefficients interpretability.

2. Assumption of normality

Figure C.1. P-P plot of Regression of standardized residual

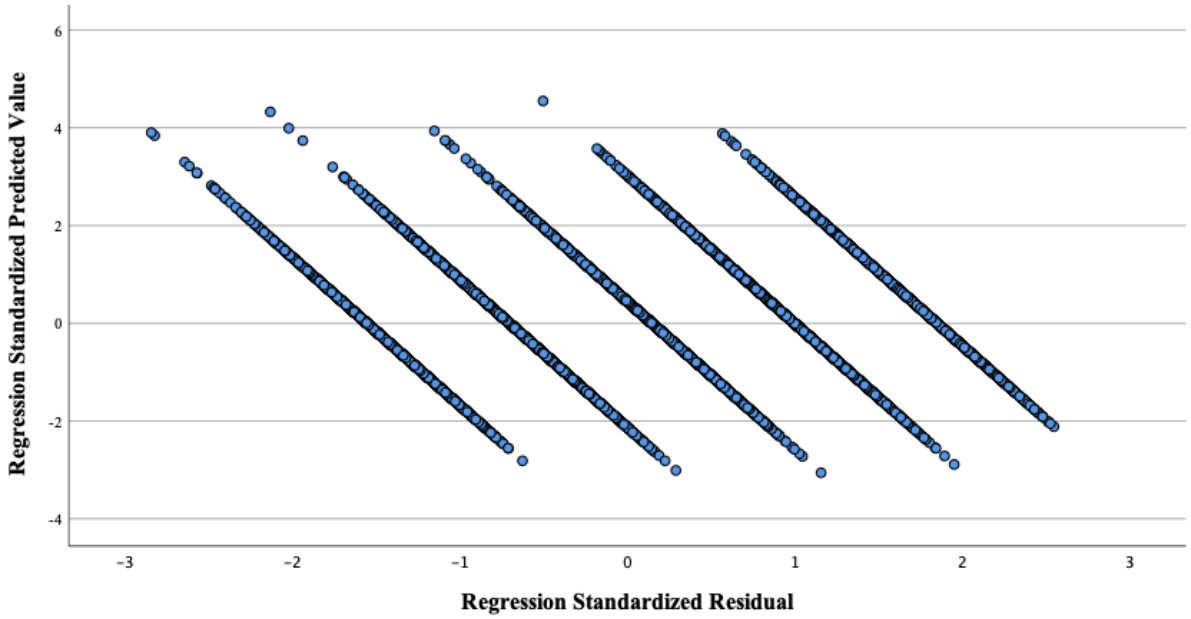


Note: Dependent Variable: Favor increase taxes on fossil fuels to reduce climate change

The normality assumption is not violated. Residuals of the regression follow a quasi-normal distribution.

3. Assumption of linearity and homoscedasticity

Figure C.2. Scatterplot of regressed standardized residual and regressed standardized predicted values



Note: Dependent Variable: Favor increase taxes on fossil fuels to reduce climate change

The relationship between the dependent variable and independent variables is linear as there is no non-linear patterns. The data is as well not heteroscedastic as testified by this table.

4. Assumption of multicollinearity

Table C.1. Linear Regression for Multicollinearity testing

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	**Tolerance**	**VIF**
1	(Constant)	1.365	,072		19,021	,000		
	GHG emissions by sector (in millions of tons of equivalent CO2) (natural log)	-,042	,004	-,048	-9,455	,000	,991	1,010
	Self-transcendence vs Self-enhancement	,153	,013	,063	12,192	,000	,954	1,049
	Openness to change vs. conservation	,266	,011	,127	24,357	,000	,948	1,055

Note: Dependent Variable: Favour increase taxes on fossil fuels to reduce climate change

All VIF values are below 5 with a minimum of 1.010 and a maximum of 1.055. As for tolerance, all the values are above 0.2 with a minimum of 0.948 and a maximum of 0.991. The assumption of multicollinearity is therefore not violated.

5. Absence of outliers and influential cases

Table C.3. Outliers Statistics (Cook's Distance and Leverage Value)

		Analog of Cook's influence statistics	Leverage value
N	Valid	33946	34840
	Missing	10441	9547
Mean		0,000030	**0,000531**
Std. Deviation		,0000178	,0004932
Minimum		,000	,000
Maximum		**,00045**	**,00234**

Table C.4. Outliers Statistics (Leverage values above three times leverage values mean)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	,00	38675	87,1	97,98	97,98
	1,00	796	1,8	**2,02**	100,0
	Total	39471	88,9	100,0	
Missing	-9,00	4916	11,1		
Total		44387	100,0		

Table C.5. Outliers Statistics (Standardized Residuals Above 3.29 Standard Deviation from the Mean)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	,00	33946	76,5	**100,0**	100,0
Missing	-9,00	10441	23,5		
Total		44387	100,0		

Table C.6. Outliers Statistics (Standardized Residuals Above 2.58 Standard Deviation from the Mean)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	,00	33946	76,5	**100,0**	100,0
Missing	-9,00	10441	23,5		
Total		44387	100,0		

Table C.7. Outliers Statistics (Standardized Residuals Above 1.96 Standard Deviation from the Mean)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	,00	33330	75,1	98,19	98,19
	1,00	616	1,4	**1,81**	100,0
	Total	33946	76,5	100,0	
Missing	-9,00	10441	23,5		
Total		44387	100,0		

Table C.8. Outliers Statistics (DFBETA for each independent variable)

		DFBETA Intercept	DFBETA GHG emissions sector ln	DFBETA Self-transcendence	DFBETA Self - enhancement	DFBETA Openness to change	DFBETA Conservation
N	Valid	38061	38061	38061	38061	38061	38061
	Missing	6326	6326	6326	6326	6326	6326
Mean		0,000030	,0000000	,0000000	,0000000	,0000000	,0000000
Std. Deviation		,00026174	,00002302	,00005466	,00003848	,00004669	,00004806
Minimum		-,00200	-,00028	-,00047	-,00030	-,00032	-,00028
Maximum		,00277	,00030	,00029	,00024	,00029	,00048

Based on table B.2, we can see that no Cook's distances are above 1. No leverage value is below -1 or above 1, yet the maximum leverage value is more than three times the mean of the leverage values. 796 cases, which represents 2.02 percent of the valid cases (see Table B.3), have a leverage value superior to three times the mean. In regard of this low, yet significant, number,

these cases will be retained in the analysis while being acknowledged since the exclusion of these do not substantially change the obtained coefficients.

Based on tables B.3 to B.5, no cases have been found with standardized residuals above 3.29 or 2.58 standard deviations from the mean. Only 1.81% of the cases have standardized residuals above 1.96 standard deviations from the mean which is less than the 5% threshold.

Finally, and based on table B.6, we can observe that no DFbeta variable has a value lower than -1 or higher than 1.

Appendix D – Alternative multivariate models

Table D1. Complex sample linear regression models – alternative GHG emissions by sector (dichotomous)

	Model 3
(Constant)	1.613***
	(.171)
High levels of GHG emissions by the sector	-.030
	(.023)
Self-transcendence vs self-enhancement	.108***
	(.026)
Openness to change vs Conservation	.188***
	(.025)
Interest in Politics (1)	.032
	(.033)
Interest in Politics (3)	-.079**
	(.028)
Interest in Politics (4)	–.156***
	(.036)
Trust in national parliament	.061***
	(.006)
Age	-.004***
	(.001)
Gender	.059**
	(.022)
Education (1)	-.069
	(.053)
Education (2)	-.044
	(.047)
Education (3)	-.038
	(0.047)
Education (5)	.007
	(.043)
Education (6)	.148**
	(.048)
Education (7)	.185***
	(.046)
Domicile type (1)	.100*
	(.040)

Domicile type (2)	.123*
	(.052)
Domicile type (3)	-.090*
	(.040)
Domicile type (5)	-.149
	(.080)
Number of observations	41 124
R-Square	0.063

Note: Complex sample linear regression coefficients with standard errors in brackets. Estimated effects of individuals' job-sector levels of GHG emissions (dichotomous), level of self-transcendence vs. self-enhancement values, level of openness to change vs. conservation values, interest in politics, trust in national parliament, age, gender, highest level of education, and domicile type on their acceptability for a carbon tax.
***p < 0.001, **p < 0.01, *p < 0.05

Model 3, compared to model 2, trades the natural logarithmic variable of GHG emissions levels of the respondent's job sector with a dichotomized version of GHG emissions by sector, with low polluting sectors (=0) and high polluting sectors (=1). Going from a low to a high polluting sector leads to an expected decrease of 0.030 ($\beta = -0.030$, $p = 0.193$), yet this expectation is statistically insignificant.

Table D2. Complex sample linear regression models – alternative basic human values

	Model 4
(Constant)	2.605***
	(.133)
Levels of GHG emissions by sector (natural log)	-.018
	(.010)
Self-transcendence	.120***
	(.024)
Self-enhancement	.007
	(.019)
Openness to change	.019
	(.020)
Conservation	–0.148***
	(.020)
Interest in Politics (1)	.011
	(.034)
Interest in Politics (3)	-.091**
	(.027)
Interest in Politics (4)	–.196***
	(.037)
Trust in national parliament	.060***
	(.006)
Age	-.003***
	(.001)
Gender	.063*
	(.025)
Education (1)	-.078
	(.057)
Education (2)	-.032
	(.049)
Education (3)	-.011
	(0.048)
Education (5)	.041
	(.045)
Education (6)	.185***
	(.050)
Education (7)	.214***
	(.047)
Domicile type (1)	.086*
	(.040)
Domicile type (2)	.103*
	(.052)

Domicile type (3)	-.073
	(.040)
Domicile type (5)	-.107
	(.070)
Number of observations	37 358
R-Square	0.067

Note: Complex sample linear regression coefficients with standard errors in brackets. Estimated effects of individuals' job-sector levels of GHG emissions, level of self-transcendence values, self-enhancement values, openness to change values, conservation values, interest in politics, trust in national parliament, age, gender, highest level of education, and domicile type on their acceptability for a carbon tax.
***p < 0.001, **p < 0.01, *p < 0.05

When replacing the two basic human values dimensions (Model 2) with the two components of each dimension individually (Model 4), both self-enhancement and openness to change become statistically insignificant. This can be explained by the fact that being polar values from self-transcendence and conservation, they do not bring significant changes in the dependent variable as self-transcendence and conservation already creates the changes one could expect from both self-enhancement and openness to change.

Table D3. Complex sample linear regression models – alternative ideology (left-right scale)

	Model 5
(Constant)	2.896***
	(.133)
Levels of GHG emissions by sector (natural log)	-.024
	(.010)
Left-right scale self-placement	–.045***
	(.006)
Interest in Politics (1)	.011
	(.034)
Interest in Politics (3)	-.091**
	(.027)
Interest in Politics (4)	–.196***
	(.037)
Trust in national parliament	.060***
	(.006)
Age	-.003***
	(.001)
Gender	.063*
	(.025)
Education (1)	-.078
	(.057)
Education (2)	-.032
	(.049)
Education (3)	-.011
	(0.048)
Education (5)	.041
	(.045)
Education (6)	.185***
	(.050)
Education (7)	.214***
	(.047)
Domicile type (1)	.086*
	(.040)
Domicile type (2)	.103*
	(.052)
Domicile type (3)	-.073
	(.040)
Domicile type (5)	-.107
	(.070)

Number of observations	33 894
R-Square	0.064

Note: Complex sample linear regression coefficients with standard errors in brackets. Estimated effects of individuals' job-sector levels of GHG emissions, level of self-transcendence values, self-enhancement values, openness to change values, conservation values, interest in politics, trust in national parliament, age, gender, highest level of education, and domicile type on their acceptability for a carbon tax.
***p < 0.001, **p < 0.01, *p < 0.05

Model 5, compared to model 2, replaces basic human values with a left-right scale (self-placement). We can observe that the estimate is considerably lower than for the two basic human values dimensions ($\beta = -0.045$, $p = 0.001$). A one point increase on the left-right scale (going more to the right) leads to an expected decrease of 0.045 points of acceptability for a carbon tax. This represents almost half a scale-point when going from the most leftist to the more rightist respondent.