Regional Sustainability 3 (2022) 281–293

Contents lists available at ScienceDirect

Regional Sustainability

journal homepage: www.keaipublishing.com/en/journals/regional-sustainability

Full Length Article

Right-wing and populist support for climate mitigation policies: Evidence from Poland and its carbon-intensive Silesia region

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ARTICLE INFO

Keywords:
Decarbonization actions
Right-wing party populism
Climate mitigation policies
Poland
Silesia

ABSTRACT

Research on environmental behaviour is often overlooked in literature on regime destabilization in energy transitions. This study addresses that gap by focusing on socio-political and demographic factors shaping support for carbon regime destabilization policies in one of the most carbon-intensive regions of Europe. Carbon-intensive industries, especially coal mining and coal-based power generation, are often concentrated in a few carbon-intensive regions. Therefore, decarbonization actions will affect those regions particularly strongly. Correspondingly, carbon-intensive regions often exert significant political influence on the two climate mitigation policies at the national level. Focusing on Poland, we investigate socio-political and demographic factors that correlate with the approval or rejection of the two climate mitigation policies: increasing taxes on fossil fuels such as oil, gas, and coal and using public money to subsidize renewable energy such as wind and solar power in Poland and its carbon-intensive Silesia region. Using logistic regression with individual-level data derived from the 2016 European Social Survey (ESS) and the 2014 Chapel Hill Expert Survey (CHES), we find party-political ideology to be an important predictor at the national level but much less so at the regional level. Specifically, voting for right-wing party is not a divisive factor for individual support of the two climate mitigation policies either nationally or regionally. More interestingly, populism is a strong factor in support of increasing taxes on fossil fuel in the carbon-intensive Silesia region but is less important concerning in support of using public money to subsidize renewable energy in Poland overall. These results show the heterogeneity of right-wing party and populism within the support for the two climate mitigation policies. Socio-demographic factors, especially age, gender, education level, employment status, and employment sector, have even more complex and heterogeneous components in support of the two climate mitigation policies at the national and regional levels. Identifying the complex socio-political and demographic factors of climate mitigation policies across different national versus carbon-intensive regional contexts is an essential step for generating *in situ* decarbonization strategies.

1. Introduction

Socio-technical regimes are always subject to a range of pressures related to economic cycles, geopolitics, socio-cultural attitudes and trends, social movements, and global environmental changes (Smith et al., 2015). While some of these pressures affect specific regimes,

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https://doi.org/10.1016/j.regsus.2022.11.001
Received 30 May 2022; Received in revised form 12 October 2022; Accepted 4 November 2022
Available online 24 November 2022

others reflect general social changes, such as demographic shifts. Socio-technical transition research on how complex systems such as energy production, mobility, or agriculture are becoming more decarbonized and sustainable systems has become prominent (Markard et al., 2012). Hence, researchers are investigating the mechanisms and patterns of regime destabilization to provide insights into incumbent regimes and niche agents during the dynamic phase of transition (Kuokkanen et al., 2018; Leipprand and Flachsland, 2018; Yazar et al., 2020). Destabilization-inducing policies have been found to be essential for system transition to enable the disruption of a dominant regime (e.g., carbon-intense energy production) (Berkhout, 2006; Kivimaa and Kern, 2016). The emerging scholarship in regime destabilization addresses energy transition by looking beyond conventional governance approaches. It highlights the importance of agents in the less institutionalized multi-actor networks, as well as rules, norms, and policy instruments that surround socio-technical systems (Bergek et al., 2013; Kuokkanen et al., 2018; Yazar et al., 2020) on multiple scales (Farla et al., 2012; Jensen et al., 2016; Kuokkanen and Yazar, 2018; Caprotti et al., 2020), considering specific place and space characteristics (Truffer and Coenen, 2012; Binz et al., 2020).

The destabilization processes in the carbon-intensive regions in Europe necessarily involve fundamental system changes. They do not simply substitute one energy technology for another. Instead, they require simultaneous changes to very different yet interdependent sub-systems in co-evolutionary processes (Geels and Schot, 2010). Regime destabilization is highly dependent on the context of political and economic institutions, organizations, private companies, and industries, public authorities, and individual entrepreneurs (Farla et al., 2012). Yet, individuals' perceptions are also important in identifying opportunities and barriers for potential decarbonization actions. Individuals' perceptions are associated with their cognitive abilities, which are shaped by socio-political and demographic factors (Grothmann and Patt, 2005; Eakin et al., 2016; Herrfahrdt-Pähle et al., 2020). These factors guide the interpretations of changing contexts that enable or affect decarbonization actions (e.g., lobbying, policy entrepreneurship, or participation in local government or elections). Based on the rich literature on environmental behaviour that explains preferences and attitudes towards the environment, researchers pay increasing attention to cognitive and behavioural aspects, as well as how socio-political and demographic factors affect individual behaviour in support of the climate mitigation policies (Leiserowitz, 2006; Spence et al., 2012; van der Linden, 2014; Goldberg et al., 2020; Yazar and York, 2022).

The relevant literature suggests that destabilizing incumbent fossil industries, often concentrated in carbon-intensive regions, is a prerequisite for successful decarbonization (Henderson and Sen, 2021; Hermwille, 2021). Yet, scholarship on regime destabilization is not seen through the perspective of comparison between regions and countries. Nor are the socio-political and demographic factors of residents in carbon-intensive regions moving towards regime destabilization studied broadly. Fossil-intensive regimes are strongly embedded in particular regions, and successful clean-energy transitions urgently require motivating wider social acceptance in those regions. While research covers the collective actions to support decarbonization (Baigorrotegui, 2019) and the tactics of opponents of energy transitions in different countries and carbon-intensive regions (Sovacool, 2021), more attention must be given to socio-political and demographic factors that affect attitudes towards climate mitigation policies in those regions. Thus, the key research gap we address in this study is the socio-political and demographic factors shaping the support of locals across the nation and in carbon-intensive regions for climate mitigation policies that may influence regime destabilization.

We define carbon-intensive regions as economic areas, in which the production and/or heavy use of fossil fuels constitute an important source of economic prosperity and added value in the region (Hermwille, 2021). Studies show that some actors inside and outside certain carbon-intensive regions recognize the need to shift away from dependence on carbon-intensive industries to address climate change and to adapt to the legacy industries' declining economic competitiveness (Fisher and Smith, 2012). On the other hand, there is also push-back on transition proposals from traditional industries and associated actors that weaken government support (Hess et al., 2021).

In line with the above situation, using the 2016 European Social Survey (ESS) and the 2014 Chapel Hill Expert Survey (CHES), we focus on the two climate mitigation policies that would contribute to regime destabilization (if implemented): (1) increasing tax on fossil fuels such as oil, gas, and coal, and (2) using public money to subsidize renewable energy such as wind and solar power, which are suggested measures to reduce climate change. These two climate mitigation policies are considered to be particularly effective in reducing greenhouse gas (GHG) emissions. Increasing taxes on fossil fuels such as oil, gas, and coal impose external costs and make polluters pay for their previous emissions (Baranzini et al., 2017), and subsidizing renewable energy might displace some fossil fuel use and its associated harmful effects on the environment and people (Cullen, 2017). We draw on a comparative case study of Poland and the Silesia, which is the carbon-intensive region of Poland. Poland is still the largest coal-based European economy, with hard coal being the main energy resource, although its share is decreasing. The phasing out of the coal industry has a regional dimension. With more than 75,000 workers employed in coal mining and power generation, Silesia is by far the most important region for coal mining both in Poland and the European Union. Capturing socio-political and demographic factors affecting individuals' perceptions about decarbonization actions can underline the most persistent factors either impeding or accelerating regime destabilization pathways at the national level or in carbon-intensive regions.

In the next section, we provide the theoretical context using literature from transition studies and the broader social science research stream on environmental behaviours. These researches guide our selection of factors for analysis and explain how they affect policy support at the national and regional levels. We develop a set of four hypotheses associated with national and regional trends in support of the two climate mitigation policies. Then, we provide background context, survey design, variables, and models in Poland and its carbon-intensive Silesia region. The section of results presents a conceptual model of factors that promote and support the two climate mitigation policies, and highlights significant relationships. We found several significant differences between the nation and its carbon-intensive region. These differences are subsequently discussed in detail: party-political ideology is an important predictor at the national level, but not at the regional level. Surprisingly, populism plays an important role in support of increasing taxes on fossil fuel (such as oil, gas, and coal) at the regional level. Socio-demographic factors, including gender, age, education level, employment status, and

employment sector, show great differences in their correlations with supporting for the two climate mitigation policies at the national and regional levels.

2. Theoretical context and hypotheses: regional versus national support for the two climate mitigation policies

Decarbonizing energy production has been the prime focus of European climate policy over the past two decades. Studies have shown that national political agendas, global trends, and economic crises can trigger the destabilization of carbon-intense regimes and enable low-carbon transitions (Turnheim and Geels, 2012; Seto et al., 2016). The idea of climate mitigation policies entails countries destabilizing their incumbent regimes to create a new decarbonized socio-economic system through actions such as investing in clean energy and capping the emissions of certain economic sectors. However, predicting the outcomes of these actions is complicated because they inevitably require trade-offs from regions where community prosperity (in areas such as job security or division of labour) depends on the incumbent carbon-intense technology and infrastructure. We argue that socio-political and demographic factors support for the two climate mitigation policies differently at the national land regional levels because of the more immediate exposure of regime destabilization at the regional level. To conduct analyses in Poland and its carbon-intensive Silesia region, we specifically focus on socio-political factors, including the incumbent party-political ideology of populism, its anti-elitist and anti-establishment rhetoric, concerns about climate change, and socio-demographic factors, including gender, age, education level, employment status, and employment sector, in support of the two climate mitigation policies to address climate change in Poland and its carbon-intensive Silesia region.

2.1. Theoretical context and hypotheses of socio-political factors

2.1.1. Preferred party-political ideology

The effects of party-political affiliations and ideology are often included in models in public support of the two climate mitigation policies (Jenkins-Smith et al., 2020; Goldberg et al., 2021; Yazar and York, 2022). Analyses of the United States generally show that Democrat voters and liberals are more supportive of the two climate mitigation policies (Leiserowitz, 2006; McCright, 2011; Mildenberger et al., 2017; Goldberg et al., 2020). In contrast, right-wing party supporters are more inclined to pay for the two climate mitigation policies than left-wing party supporters in the post-communist countries of Europe. Critics attribute these results to the low political salience of climate change and the lack of consistency in the meaning of left- or right-wing party identification in these countries (McCright et al., 2016). Yet, unlike left- or right-wing parties in Western Europe, extreme right-wing party has shifted their narrative about climate change and energy from the rational scientific area to nationalist ideology and unverifiable myths (Forchtner, 2019). For instance, nationalistic right-wing party voters in Europe are more likely to be sceptical about climate change and less likely to support the climate mitigation policies of increasing taxes on fossil fuels such as oil, gas, and coal (Kulin et al., 2021). Climate mitigation policies are generally influenced by international or regional cooperation, and extreme right-wing party responds by establishing anti-climate narratives in which global interventions oppose national interests (Priest, 2016). In addition, attempts to restructure decarbonizing sectors in coal-intensive regions in Europe encounter opposition in the form of protests and strikes (Wehnert et al., 2018). Considering these points together, we propose the first hypothesize:

H1. Individuals who vote for extreme right-wing party are less likely than other voters to support the two climate mitigation policies at either the national or regional level.

2.1.2. Populism: anti-elitist and anti-establishment rhetoric

We define populism as a broad ideology pitting politicians and experts, i.e., “elites” against “ordinary people” (Mudde and Kaltwasser, 2013), and expect it to be supported by an experienced or anticipated loss of control or values and orientation (Decker and Lewandowsky, 2017). Populism can take different forms: right-wing, left-wing, village, parliamentary, and extra-parliamentary. However, we assume that populist rhetoric has common elements: structural socio-economic change induced by climate change policy may be experienced as a loss of control and perceived as inadvertent endangerment of the livelihoods of ordinary people. In contrast, other major trends, such as globalization and digitalization, are understood as either beyond the control of politicians or even as “natural forces”. Populist right-wing politicians with support from right-leaning media outlets cite climate skepticism to support fossil fuel-based industries and economy in certain regions (Batel and Devine-Wright, 2018; Żuk and Szulecki, 2020). This consequently leads to the polarization of society and increases social tensions between carbon-intensive regions and other regions where economy is heavily dependent on these sectors (e.g., service industry). We expect populists to take advantage of this, and hence propose the second hypothesis:

H2. Individuals from the carbon-intensive Silesia region who voted for political parties with strong anti-elitist and anti-establishment rhetoric are less likely to support the two climate mitigation policies than their counterparts at the national level.

2.1.3. Concern about climate change

Individuals support policies to deal with a problem they believe to be real, but they selectively identify or dismiss scientific information through their social and political identities (Weber and Stern, 2011; Thornton et al., 2020). Thus, informing the public through scientific articles or reports does not necessarily alter their opinion about climate change (Brulle et al., 2012; Hamilton et al., 2015). Similarly, climate skepticism is mainly driven by socio-demographic factors, political orientation, and environmental values (Hornsey et al., 2018; Yazar et al., 2022). Therefore, the transition to decarbonization involves not only technological advancements or financial

issues; it is also closely related to cultural, cognitive, and political-ideological imagination. Acknowledging climate change and global warming as a threat is a strong predictor of support for decarbonization actions (Leiserowitz, 2006; Spence et al., 2012; van der Linden, 2014; Goldberg et al., 2020). Concern about the effects of climate change may be the strongest predictor in some cases. However, critics find that priorities differ between the general public and experts in support of the two climate mitigation policies. Experts are inclined to support increasing taxes on fossil fuels such as oil, gas, and coal, as they are comparatively low-cost climate mitigation policies that can effectively reduce carbon emissions in places where they are implemented. Public opinion on increasing taxes on fossil fuels such as oil, gas, and coal can overestimate the potentially negative consequences, such as job losses, and gloss over their contribution to climate mitigation (Carattini et al., 2019). On the other hand, the general public supports the using public money to subsidize renewable energy such as wind and solar power (Sterner, 2007; Vona, 2019). At the regional level, although climate concern may be persistent, decarbonization actions may still be perceived as a direct threat to the viability of carbon-intensive industries. Thus, we expect higher resistance to the two climate mitigation policies from individuals who reside in carbon-intensive regions compared with their counterparts at the national level. Therefore, we suggest the third hypothesis:

H3. Concern about climate change predicts support for two climate mitigation policies at the national level but not at the regional level.

2.2. Theoretical context and hypotheses of socio-demographic factors

Socio-demographic factors, including gender, age, education level, employment status, and employment sector, consistently predict support for the two climate mitigation policies. While the evidence is conclusive for the role of gender, with females being more supportive of the two climate mitigation policies (Vona, 2019; Goldberg et al., 2020), it is much less so in regard to age (Shwom et al., 2010; Ballew et al., 2019). For example, research shows that in the United States overall, older Republicans are less supportive of the two climate mitigation policies, but younger Republicans are more supportive of the two climate mitigation policies (Ballew et al., 2019; Goldberg et al., 2020). Moreover, education has more variable policy support from the Democrats than from the Republicans (Goldberg et al., 2020). Researchers argue that the two climate mitigation policies can directly affect low- and middle-income households with high dependency on fossil fuels (e.g., people whose jobs most depend on them) (Klenert et al., 2018; Sivonen, 2020). Case studies also demonstrate that failure to mitigate the social and economic impacts of energy transition will result in profoundly unequal results (Sovacool, 2021). Overall, individuals in carbon-intensive regions may have limited capacity to adapt to the structural changes induced by the two climate mitigation policies, so they may be less likely to support the two climate mitigation policies. We then propose the fourth hypothesis:

H4. Socio-demographic factors, namely gender, age, education level, employment status, and employment sector, have both positive and negative effects on support for the two climate mitigation policies. In particular, individuals in carbon-intensive regions will be more exposed to uncertainty; therefore, socio-demographic factors will have more potent effects in reducing support for the two climate mitigation policies at the regional level than at the national level.

3. Research design and methods

3.1. Study area

The main energy source of Poland was primarily coal in the past. This has long safeguarded the economy and national pride (Kuchler and Bridge, 2018). However, the share of coal in the Polish energy mix has been declining steadily over the recent decades. In 2019, coal remained the single most important energy source in Poland, contributing 44.7% of primary energy consumption. The role of coal was even more pronounced in power generation (73.1%) in 2019 (Ritchie and Roser, 2019). The high proportion of coal production makes Poland relatively independent of energy imports. In 2019, Poland ranked 19th of the most energy import-dependent countries in the Europe, importing 46.8% of its energy (EuroStat, 2019). Although by 2017, 75.0% of the employment in the coal mining industry had shifted to other sectors, the industry remained politically important. Poland's energy production and capacities are highly concentrated in a few regional economic centers, with Silesia being the most important.

Silesia is the most densely populated region of the country, with 4.8 million people living in an area that represents 3.9% of Polish territory. The Silesian economy is characterized by labour and carbon-intensive traditional raw material industries including mining (predominantly coal), and metallurgic and chemical sectors. Silesia is ranked among the leading regions of Poland for its social and economic potential, and its coal production is the largest in the European coal regions (Wehnert et al., 2018). This region produces the second-highest contribution to national GDP after the Masovia Voivodeship, which includes the Warsaw, the capital of Poland (Skoczkowski et al., 2020). Hard coal still plays a prominent role in the Silesian socio-cultural context, even though its economic domination is decreasing. Strong links along politics, economy, and workforce in the coal sector are supported by strong trade union membership, the fully or partially state-owned mining industry, and the huge revenues brought to the surrounding communities in the region (Dzieciolowski and Hacaga, 2015; Szpor and Ziłkowska, 2018). Previous attempts at restructuring the carbon-intensive sector have been met by heavy protests and strikes by the unions. Most political parties and multiple companies, workers, and community stakeholders strongly oppose reducing the use of hard coal (Wehnert et al., 2018).

3.2. Data sources

We used the 2016 ESS and the 2014 CHES (Bakker et al., 2015) datasets to test our four hypotheses. Round 8 of the 2016 ESS was conducted from August 2016 to December 2017, with data collection in the 23 individual countries, usually conducted within a three-month period. ESS8 Data Documentation Report (European Social Survey, 2016) contains an environmental module dedicated to beliefs about climate change and energy security, as well as energy preferences. Detailed information about the full questionnaire and data collection, including coding and software used in the different countries, can be found in the ESS8 Data Documentation Report (European Social Survey, 2016). The survey involves strict random probability sampling, a minimum target response rate of 70.0% in each country (including Poland), and rigorous translation protocols. Interviews were conducted in person through computer-assisted personal interviewing or computer-assisted mobile interviewing at the homes of participants aged 15 years old and over. For our study, we have only selected respondents who answered the questions chosen for this study (specifically preferred party, for which respondents voted); thus, participants without answers to those questions were considered "blanks" and not included in the analyses. More specifically, 1045 participants (out of 1549) from Poland overall and 126 respondents (out of 164) from the carbon-intensive Silesia region were included in our analyses.

The 2014 CHES, which is the longest-running and most extensive expert survey on political parties in Europe, was used in this study to better understand the positions of party-political ideology and populism in Poland. The 2014 CHES was administered from December 2014 to February 2015 and conducted by 337 political scientists specializing in political parties and European integration. The 2014 CHES provides information about the positioning of 268 political parties on party-political ideology, European integration, and various policy areas (Bakker et al., 2015). We specifically used the survey to gather information about the positioning of political parties in Poland on party-political ideology and these parties' anti-elitist and anti-establishment rhetoric. Selected variables from the two datasets were analyzed using individual-level logistic regression models (see Table S1 for the distribution properties of these variables in the two datasets).

3.3. Dependent variables

The 2016 ESS respondents were asked "To what extent are you in favour or against the following policies in Poland to reduce climate change: (1) increasing taxes on fossil fuels such as oil, gas, and coal? and (2) using public money to subsidize renewable energy such as wind and solar power?" A five-point scale was used, which contained the following ordinal categories: strongly in favour, somewhat in favour, neither in favour nor against, somewhat against, and strongly against. To compare their responses with the two climate mitigation policies, we specified two dependent variables: increasing taxes on fossil fuels and using public money to subsidize renewable energy.

Both responses to the two dependent variables were coded into a dichotomous variable, distinguishing between respondents who are strongly or somewhat in favour of the dependent variables (coded as 1) and respondents who are neither in favour nor against, somewhat against, or strongly against dependent variables (coded as 0). Specified in this binary form, the two dependent variables reflected either extreme or moderate support for the policies or moderate to strong opposition.

3.4. Socio-political data coding

For preferred party-political ideology, the 2014 CHES indicator coded political parties in Poland according to the left–right dimension, with the value of 0.0 denoting the extreme left-wing party, 5.0 representing the center party, and 10.0 showing the extreme right-wing party. We used the 2014 CHES trend file (Bakker et al., 2015) and selected estimates closest to the Polish election years as proxies. The party-political ideology from the 2014 CHES was matched with the parties for which respondents voted, as indicated in the 2016 ESS. We coded political parties in four categories: extreme right-wing party (including KUKIZ′15, scored at 9.5; and KORWIN, scored at 9.0), right-wing party (including Law and Justice Party, scored at 7.9; and Poland Together, scored at 7.6), center party (including Civic Platform, scored at 5.7; and Polish Peasant Party, scored at 5.2), and left-wing party (including United Left, scored at 2.7; and Modern Poland, scored at 2.7). The extreme right-wing party is treated as the reference category for the remaining three categories to capture differences between party-political ideologies.

For populism, the 2014 CHES indicator coded salience of anti-establishment and anti-elite rhetoric: the value 0.0 indicating "not important at all", and the value 10.0 denoting "extremely important". For this study, we coded two overarching categories distinguishing between respondents' preferred parties in which anti-establishment and anti-elite rhetoric is not important or closer to not important (including the following parties and scale scores: Civic Platform (1.4), Modern Poland (2.2), Polish Peasant Party (2.4), and United Left (2.8)) versus moderately to extremely important (Poland Together (6.3), Law and Justice Party (7.4), KORWIN (7.5), and KUKIZ′15 (9.0)). The latter is treated as the reference category.

To explore the relationship between the two dependent variables and the 2016 ESS respondents' concern about climate change, we used the following question: "How concerned are you about climate change?" The question was framed with a five-point scale containing the following ordinal categories: extremely concerned, very concerned, somewhat concerned, not very concerned, and not at all concerned. We coded concern about climate change as a dichotomous variable, distinguishing between respondents who expressed concern, including extremely, very, and somewhat concerned (coded as 1) and respondents who are other than concerned, including not very and not at all concerned (coded as 0). Respondents who are other than concerned, including not very and not at all concerned were treated as the reference category with which their counterparts were compared regarding the dependent variables.

3.5. Socio-demographic data classification

Respondent gender distinguishes between respondents who identify as male or female, with male as the reference category regarding the dependent variable.

Respondent age was banded into three categories of the roughly similar proportions: ≤40 years old, 41–56 years old, and ≥57 years old. Such categories were preferred to ensure even distribution so that each category has equivalent statistical power. The youngest age group (i.e., ≤40 years old) was treated as the reference category to which respondents in other age groups were compared regarding the dependent variable.

Respondents' education level was grouped into two broader categories distinguishing between respondents who had reported having completed any grades of 1–8, grades of 9–11, high school, community college, and vocational or technical school versus respondents who reported having completed college or graduate and professional schools. The former category was treated as the reference category.

Respondents' employment status was grouped into two overarching categories to distinguish between respondents who were employed in paid work (employee, self-employed, or working for family business) and those who were unemployed. The latter category was treated as the reference category.

Finally, respondents' employment sector was grouped into two categories to distinguish between respondents who worked in carbon-intensive sectors[1] and those who did not. The latter was treated as the reference category.

3.6. Approach to the analysis

A total of four models were fitted using the aforementioned variables from the survey datasets. Specifically, two models were created for each of the two dependent variables: increasing taxes on fossil fuels and using public money to subsidize renewable energy. The models investigated the relationships between these two dependent variables and a series of independent and control variables (socio-political and demographic factors). Cramer's V metric was used to quantify the strength of association between the independent and control variables, and to explore multicollinearity concern (Wang, 1986). Cramer's V values do not highlight strong associations between the independent and control variables that the models used (see Table S2).[2]

Given the small sample size available to this study, the individual-level logistic regression models were deemed to be the preferred modelling option. The risk of singularity limits the number of variables that any single model can account for without demonstrating the signs of over-fitting, as positive tests for singularity would indicate. We considered a large number of the 2016 ESS and the 2014 CHES (control and independent) variables, but ultimately adopted the theoretically driven set of control and independent variables presented here, while managing and mitigating the risk that observations made by this study become highly specific or too consistent with the 2016 ESS respondent sample. Goodness-of-fit for the reported models was evaluated using the Akaike Information Criterion (AIC) metric. Reported models were also tested for singularity, to ensure that all elements of their corresponding variance–covariance matrices could be assumed to be non-zero. Only non-singular models were reported in this paper (singularity tolerance = 0.00001). The analysis for this study was conducted within the R for statistical analysis (R Core Team, 2013).

4. Results

The results of this study are shown in Table 1 below. Using two individual-level logistic regression models, we explored the relationships between responses to the two dependent variables (increasing taxes on fossil fuels and using public money to subsidize renewable energy) and socio-political factors (preferred party-political ideology, populism, and concern about climate change) and socio-demographic factors (gender, age, education level, employment status, and employed sector).

4.1. Socio-political characteristics

4.1.1. Preferred party-political ideology characteristics

At the national level, voting for parties other than those on the extreme right-wing party significantly correlates with support for the two climate mitigation policies. More specifically, voting for the right-wing party (Poland Together and the Law and Justice Party) and center party (Civic Platform and Polish Peasant Party) in Poland has a significant effect on support for both policies. Meanwhile, voting for the left-wing parties (United Party and Modern Poland) only shows significance in support of using public money to subsidize renewable energy. In contrast, the correlation is much less pronounced in the carbon-intensive Silesia region. Voting for the right-wing party correlates with support for a tax on fossil fuels and voting for the right-wing and center parties correlates with support for using public money to subsidize renewable energy. The left-wing party shows no significant support for the two climate mitigation policies. Hence, our first hypothesis (H1) is partially confirmed.

[1] The identified carbon-intensive sectors are: extraction of crude petroleum and natural gas, manufacture of chemicals and chemical products, manufacture of coke and refined petroleum products, mining of coal and lignite, other mining and quarrying, manufacture of motor vehicles, trailers, and semi-trailers, and manufacture of rubber and plastic products.

[2] The income variable in the 2016 ESS dataset for Poland is excluded from the models owing to its especially high collinearity with the independent and control variables.

Table 1
Individual-level logistic regression models for the relationships between the two dependent variables (increasing taxes on fossil fuels and using public money to subsidize renewable energy) for socio-political and demographic factors in Poland and its carbon-intensive Silesia region.

Variables		Category	Poland		Silesia region	
			Increasing taxes on fossil fuels	Using public money to subsidize renewable energy	Increasing taxes fossil fuels	Using public money to subsidize renewable energy
			Coefficient	Coefficient	Coefficient	Coefficient
Intercept		–	−2.609***	0.136	1.811***	0.641
			(0.359)	(0.263)	(0.642)	(0.524)
Socio-political factors	Respondent preferred party-political ideology	Voted for right-wing party versus extreme-right party	0.505**	0.665***	1.045*	1.336*
			(0.241)	(0.173)	(0.614)	(0.605)
		Voted for center party versus extreme right	0.483*	0.635***	0.211	0.980*
			(0.249)	(0.182)	(0.733)	(0.551)
		Voted for left-wing party versus extreme-right party	0.362	1.053***	−0.069	0.898
			(0.300)	(0.296)	(1.123)	(1.085)
	Respondent preferred party anti-elitist and anti-establishment rhetoric	Voted for party for which populist rhetoric is not important or closer to not important versus moderately to extremely important	0.051	0.229*	−0.694*	0.104
			(0.139)	(0.120)	(0.409)	(0.402)
	Respondent concerned about climate change	Concerned versus unconcerned	0.544***	0.799***	1.655**	1.030**
			(0.175)	(0.135)	(0.671)	(0.516)
Socio- demographic factors	Respondent gender	Female versus male	−0.203	−0.271*	−1.684***	−0.038
			(0.157)	(0.140)	(0.502)	(0.462)
	Respondent age	41–55 years old versus ≤40 years old	−0.074	−0.012	0.002	2.284***
			(0.208)	(0.182)	(0.560)	(0.857)
		≥56 years old versus ≤40 years old	−0.070	−0.006	0.078	0.539
			(0.217)	(0.193)	(0.606)	(0.600)
	Respondent education level	College or graduate and professional school versus grades of 1–11, high school, community college, vocational or technical school	0.386**	0.078	0.469	−0.037
			(0.175)	(0.160)	(0.560)	(0.530)
	Respondent employment status	Unemployed versus employed	0.247	−0.221	1.165*	−1.542*
			(0.196)	(0.174)	(0.668)	(0.794)
	Respondent employment sector	Carbon-intensive sectors versus other than carbon-intensive sectors	0.417**	0.482**	−1.331**	−1.246***
			(0.204)	(0.210)	(0.528)	(0.451)

Note: Values in parentheses are standard error; ***, $P < 0.001$ level; **, $P < 0.05$ level; *, $P < 0.1$ level. Sample sizes of Poland and its carbon-intensive Silesia region are 984 and 106, respectively. The values of Akaike Information Criterion (AIC) of increasing taxes on fossil fuels and using public money to subsidize renewable energy are 1510 and 1917 in Poland, respectively, and 195 and 192 in its carbon-intensive Silesia region, respectively.

4.1.2. Populism: anti-elitist and anti-establishment rhetoric characteristics

The model results show that voting for political parties for which anti-elitist and anti-establishment rhetoric is not important or close to not important is a significant predictor of support for the using public money to subsidize renewable energy at the national level, whereas in the carbon-intensive Silesia region, voting for parties where anti-elitist and establishment rhetoric is moderately or extremely important has a significant effect on support for increasing taxes on fossil fuels. Hence, our second hypothesis (H2) is partially confirmed.

4.1.3. Concern about climate change characteristics

Concern about climate change significantly predicts support for the two climate mitigation policies both in Poland and its carbon-intensive Silesia region. Therefore, our third hypothesis (H3) is partially confirmed.

4.2. Socio-demographic characteristics

There are important socio-demographic differences in support of the two climate mitigation policies at the national and regional levels.

Gender has a significant effect on support for the two climate mitigation policies in both Poland and its carbon-intensive Silesia region. Specifically, individuals who identify as male only strongly support using public money to subsidize renewable energy in Poland, whereas males only support increasing taxes on fossil fuels in the carbon-intensive Silesia region.

Age is one of the strongest predictors of views in the carbon-intensive Silesia region. Specifically, individuals in this region aged 41–55 years old strongly support the policy of using public money to subsidize renewable energy. Yet, age has no significant correlation with the two climate mitigation policies at the national level.

Higher education is the strongest predictor in support of increasing taxes on fossil fuels at the national level. At the regional level, education has no significant effect on support for increasing taxes on fossil fuels, or on support for using public money to subsidize renewable energy.

Employment is also one of the strongest predictors of support in the carbon-intensive Silesia region for the two climate mitigation policies. Surprisingly, unemployed individuals in the carbon-intensive Silesia region support increasing taxes on fossil fuels, whereas employed individuals support using public money to subsidize renewable energy. Employment has no significant effect on the two climate mitigation policies at the national level.

Employment sector is the strongest predictor, and this shows differences at national and regional levels in support of the two climate mitigation policies. More specifically, people who work in carbon-intensive sectors strongly support the two climate mitigation policies in Poland. In contrast, respondents employed in other than carbon-intensive sectors in Silesia region strongly support the two climate mitigation policies. Hence, our fourth hypothesis (H4) is partially confirmed.

Table 2 shows the statistically significant effects of socio-political factors (preferred party-political ideology, populism, and concern about climate change) and demographic factors (gender, age, education level, employment status, and employed sector) on the two climate mitigation policies.

Table 2
Statistically significant effects of the socio-political and demographic factors on the two climate mitigation policies.

Variables		Category	Increasing taxes on fossil fuels		Using public money to subsidize renewable energy	
			Poland	Silesia region	Poland	Silesia region
Socio-political factors	Respondent preferred party-political ideology	Voted for right-wing party versus extreme-right party	+	+	+	+
		Voted for center party versus extreme-right party	+		+	+
		Voted for left-wing party versus extreme-right party			+	
	Respondent preferred party anti-elitist and anti-establishment rhetoric	Voted for party where populist rhetoric is not important to close to not important versus moderately to extremely important		−	+	
	Respondent concerned about climate change	Concerned versus unconcerned	+	+	+	+
Socio-demographic factors	Respondent gender	Female versus male		−	−	
	Respondent age	41–55 years old versus ≤40 years old				+
	Respondent education level	College or graduate and professional school versus grades of 1–11, high school, community college, and vocational or technical school	+			
	Respondent employment status	Unemployed versus employed		+		−
	Respondent employment sector	Carbon-intensive sector versus other than carbon-intensive sectors	+	−	+	−

Note: +, statistically significant positive effect; –, statistically negative effect. Empty means there is no statistically significant effect.

5. Discussion

Despite roadmaps depicting a European notion of decarbonization strategies, we find socio-political and demographic differences in Poland and its carbon-intensive Silesia region in terms of decarbonization actions. Our study shows how preferences for destabilizing the incumbent regime are not only mediated and influenced by a variety of preferred party-political ideology and populism, but also closely tied to socio-demographic factors (e.g., gender, age, education level, employment status, and employment sector).

5.1. Socio-political variable differences

In terms of preferred party-political ideology, concern has been raised about assuming direct linkages between right-wing parties and their opposition to any climate mitigation policy (Hess and Renner, 2019). For instance, the current ruling right-wing party (Poland's Law or Justice Party), was pro-coal and opposed to the two mitigation climate policies. However, since the party came to power in 2015, it has had to maintain certain renewable energy policies under the Europe mandate and has supported smaller-scale renewables (e.g., solar photovoltaic) (Szulecki and Ancygier, 2015). Similarly, individual support for certain political parties is directly related to their social (e.g., family traditions and moral values) and political (e.g., nationalist ideology) identities (Kulin and Johansson Sevä, 2019). Therefore, voting for one party does not necessarily always align with individual consent to that party's political agenda on decarbonization.

Our findings suggest that right-wing party voters in Poland support the two climate mitigation policies at the national and regional levels, whereas no significant difference is found between voters for center and left-wing parties in their support of increasing taxes on fossil fuels at the regional level. Thus, even though right-wing party in Poland opposes coal mine closures and decarbonization actions encouraged by the European Union, we infer that right-wing party in Poland may not have a dominant influence over voter behaviour in energy transition policies. Arguably, a direct threat to the viability of carbon-intensive industries owing to increasing taxes on fossil fuels at the regional level may be recognized by the center and left-wing party voters. We also find that renewables are supported by all party voters at the national and regional levels, but no significance is observed for voters from left-wing party at the regional level. We may also assume that left-wing party voters may have disregarded the region's renewable energy potential. Another potential explanation could be that the left-wing party is limited and strongly dependent on older voters, and it may be the case that many retired coal miners and traditional industry workers vote for the left-wing party remembering the “good old days” of expansive industrialization in the carbon-intensive Silesia region in the mid-1960s. More importantly, our results highly align with a recent study showing a strong consensus in Polish society, regardless of party-political ideology, in support of energy transition (94.0%) and an additional tax on large industrial companies (69.0%) to transform the carbon-intensive Silesia region into a producer of clean energy (Żuk et al., 2021).

Increasing populist right-wing party mostly characterized by nationalism, especially in Eastern Europe, constitutes an obstacle to decarbonizing the incumbent energy regimes. Supporters often espouse the skepticism of global environmental change. For instance, the elements of populism spurred by the right-wing party in Poland rely on anti-elitism and nationalism opposing social elites enacting Eurocentric decarbonization actions, which are seen as threats to popular lifestyles and customs (Szulecki and Ancygier, 2015; Huber et al., 2021; Żuk et al., 2021). Although party-political ideology would suggest that populist political parties tend to deny the human dimensions of climate change, scholars argue that different populist political parties, including those on the right-wing, left-wing, and center parties, may contradict and modify this position depending on the emerging political-economic trends in given national and regional contexts (Mudde and Kaltwasser, 2013; Jahn, 2021). Our results suggest that such contradictions over the actions of populist political parties towards decarbonization may also reflect the behaviour of voters. More specifically, we find that voting for preferred parties for which populism is less important has a significant effect on supporting for using public money to subsidize renewable energy at the national level. This is in line with the existing literature showing that regardless of party-political ideology and populism, Polish society supports a clean-energy transition (Żuk et al., 2021).

Interestingly, we find that those who support populist political parties also support increasing taxes on fossil fuels at the regional level. However, the importance of trust far surpasses that of party-political ideology for individuals paying higher taxes for environmental protection (Fairbrother et al., 2019). Hence, even though populist right-wing party takes an active anti-coal stance coupled with nationalism and protectionism narratives in the carbon-intensive Silesia region, individuals may support increasing taxes on fossil fuels owing to their trust in the political parties they voted for to succeed in restructuring carbon-intensive industries without harming their livelihoods. For instance, several years ago, the incumbent national government in Poland introduced a levy on transport fuel to fund electrical vehicle deployment (Wappelhorst and Pniewska, 2020) that caused no protest (e.g., the “yellow vests” protest in France). Our quantitative comparative study with a small sample size can only provide indications of these causal mechanisms.

Concern about climate change significantly affects individuals at both the national and regional levels in terms of supporting for the two climate mitigation policies. This supports existing findings that people who recognize climate change believe it is occurring, are concerned about the risks, and are more likely to support climate change policies (Fairbrother et al., 2019; Yazar et al., 2021). Although not surprising, this finding underscores the potential for complacency among people who are not personally exposed (e.g., the contribution of Silesia to global emissions and its impacts on locals’ health is much higher than that in other regions in the nation) and perceive global climate change to be a threat to their livelihoods.

5.2. Socio-demographic variable differences

There are important socio-demographic differences underlying support for the two climate mitigation policies at the national and regional levels.

For gender, the literature suggests that females are more supportive of the two climate mitigation policies than males (Shwom et al., 2010). However, we find that males show stronger support for using public money to subsidize renewable energy in Poland. Moreover, males in the carbon-intensive Silesia region tend to support increasing taxes on fossil fuels. These results may suggest that shifting male workers from carbon-intensive industries to other service sectors lead males to support the two climate mitigation policies that can accelerate phasing out carbon-intensive industries at the national and regional levels. Certainly, phasing out carbon-intensive industries also has various indirect effects for females (e.g., indirect employment possibilities and dependence on partners' incomes), which are not captured by the data we analyzed here.

Age and employment are the strongest predictors only at the regional level, and no significant effects are observed at the national level. The carbon-intensive Silesia region has seen a major demographic decline among the younger population, especially from traditional mining communities (Runge et al., 2020), and underground mineworkers mostly retire at the age of 45 or 55 years old (after 25 years of work) (Dzieciolowski and Hacaga, 2015) with substantial pensions (Bukowski et al., 2018). Considering the remaining age groups in the workforce that are outside of mining jobs and benefits in the carbon-intensive Silesia region, we can infer that those respondents aged 41–55 years old support renewables to replace limited employment opportunities for specifically this age group in the region. In addition, unemployment and poverty rates in the carbon-intensive Silesia region are low compared with those in other Polish regions (Skoczkowski et al., 2020). Thus, the support among the unemployed individuals for increasing taxes on fossil fuels and employed individuals being the strongest predictors of support for using public money to subsidize renewable energy in the carbon-intensive Silesia region of may indicate a need for direct government support for new job creation.

Higher education is the strongest predictor of support for increasing taxes on fossil fuels in Poland, but it has no significance effect on support for using public money to subsidize renewable energy at the national level. At the regional level, education level has no significant effect on support for the two climate mitigation policies. This supports existing findings that education has greater variability in relation to climate policy support (Goldberg et al., 2020).

Employment sector is the strongest predictor to support the two climate mitigation policies, and it shows regional and national differences in Poland. More specifically, people who work in carbon-intensive sectors strongly support the two climate mitigation policies in Poland. In contrast, respondents in Silesia who are employed only in sectors other than carbon-intensive sectors strongly support the two climate mitigation policies. The threat to employment in carbon-intensive industries has come more from technical change and globalization, as employment in fossil fuel industries in the Organization for Economic Co-operation and Development (OECD) countries is very small. For instance, direct employment in the coal industry makes up at most 0.5% of employment in Poland (Lockwood, 2018). This phenomenon could explain why respondents employed in carbon-intensive sectors support the two climate mitigation policies at the national level. Yet, our regional-level results suggest that individuals employed in sectors other than carbon-intensive ones have such a decisive effect in the positioning of support for the two climate mitigation policies.

Overall, regime destabilization in the energy sector is held back by multiple forces, not least by powerful incumbents that often exert systematic resistance to change (Harich, 2010). Moreover, party-political ideology, populism, and socio-demographic factors are complex at both the national and regional levels. The majority of climate mitigation policy analyses and models of climate beliefs are based on the national-level data (Klenert et al., 2018; Sivonen, 2020; Kulin et al., 2021), and we argue that our study can make an important contribution by using individual data based on the national and regional levels to analyze and compare socio-political and demographic factors in support of the two climate mitigation policies that can potentially contribute to or impede regime destabilization in Poland and its carbon-intensive Silesia region. Decarbonization will affect carbon-intensive regions particularly strongly, which may generate strong opposition to the two climate mitigation policies. Identifying the socio-political and demographic factors of climate mitigation policy across different carbon-intensive regional contexts is an essential step for generating *in situ* decarbonization strategies for regions. Furthermore, the complex effects of party-political ideology and populism in support of decarbonization actions may help researchers to identify political room for maneuver in regime destabilization as well as comprehending the logic of contestation in energy transitions. Lastly, Poland is relatively extreme in its dependence on coal both for energy security as well as jobs. On the other hand, Silesia is relatively diversified economically, and the 2016 ESS was carried out during a period of relatively stable economic growth in both Poland and its carbon-intensive Silesia region. Thus, results may differ in more dire economic circumstances.

6. Conclusions

Decarbonizing carbon-intensive regional economies involves many challenges, and socio-political and demographic factors remain potent aspects affecting rapid transition. The asymmetric power relations among the political actors, policymakers, and businesses ignore the recognition of vulnerable groups whose livelihoods are still based on carbon-intensive sectors, in the process of energy regime transition. With this study, we expect public support for decarbonization actions for regime destabilization at the regional level to differ from the overall national support and to be more pronounced according to socio-political factors, including preferred party-political ideology, populism, and concern about climate change, and socio-demographic factors, especially age, gender, education, employment status, and employment sector.

The results reveal that national versus regional support for the two climate mitigation policies is generally limited. Nevertheless, this comparative approach to research on regime destabilization within one country demonstrates that our understanding of the socio-political and demographic factors in decarbonization actions remains fragmented and still lacks a coherent theoretical framework. For instance, we found that party-political ideology is an essential predictor at the national level but is much less so at the regional level.

Yet, voting for right-wing party is not a divisive factor in individual support for the two climate mitigation policies at both the national and regional levels. However, populism is a strong factor in support of increasing taxes on fossil fuels at the regional level, while it is less important in support of using public money to subsidize renewable energy at the national level. These results are crucial indications of the heterogeneity of right-wing party, populism, and voter support for the two climate mitigation policies.

Socio-demographic factors have even more complexity and heterogeneity in relation to national and regional support for the two climate mitigation policies. Instead of addressing these complex socio-demographic factors, structural policy has historically responded in a reactive manner, too often focused on relieving the symptoms of structural change instead of proactively seeking to overcome the underlying socio-demographic structural weaknesses and increasing the economic competitiveness of the vulnerable regions. The results outlined in this study offer an attempt to incorporate environmental behaviour into the transition literature by considering specific socio-political factors (e.g., preferred party-political ideology, populism, and concern about climate change) and socio-demographic factors (e.g., age, gender, education level, employment status, and employment sector) to encourage further studies based on the carbon-intensive regions.

Declaration of opinion

The content of this article does not reflect the official opinion of the European Union. Responsibility for the information and views expressed herein lies entirely with the authors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No:884539 "Carbon Intensive Regions in Transition - Unravelling the Challenges of Structural Change (CINTRAN)", which has an objective to understand the multiple characteristics of the identified carbon-intensive regions to provide the necessary knowledge to understand the transition challenges in the regions. The authors thank Mr. Aleksander Śniegocki, the head of the Energy, Climate and Environment Programme at Wise Europe Institute, Warsaw, Poland for helpful comments on earlier versions of this article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.regsus.2022.11.001.

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