"The Effect of Public Opinion on Climate Policy Performance in the 28 EU Member States"

By

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Abstract

This study was aimed at investigating the effect of public opinion on climate policy performance in the 28 EU member states while accounting for other influential factors such as GDP, household income levels, education and fossil fuel dependency. A series of multiple regression tests was conducted to do this with data sourced from both the Eurobarometer survey and Eurostat. Unobserved country and year variables were also accounted for. The results show that public opinion, GDP and household income are all significant predictors of climate policy performance with public opinion exerting much more influence than the latter two. This study adds to an existing body of research on the relationship between public opinion and climate policy in the EU with implications such as highlighting responsiveness of EU states to public opinion.

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Declaration

I hereby declare that this project is entirely my own work, in my own words, and that all sources used in researching it are fully acknowledged and all quotations properly identified. It has not been submitted, in whole or in part, by me or another person, for the purpose of obtaining any other credit / grade. I understand the ethical implications of my research, and this work meets the requirements of the Faculty of Arts, Humanities and Social Sciences Research Ethics Committee.

Signed _____

Introduction

In 1988 the UN established the Intergovernmental Panel on Climate Change, with the task of constructing a; "comprehensive review and recommendations with respect to the state of knowledge of the science of climate change; the social and economic impact of climate change, and potential response strategies and elements for inclusion in a possible future international convention on climate" (International Panel on Climate Change, 2020). Amidst sceptic groups claims of a lack of consensus amongst the climate science community, the IPCC publish their 2007 synthesis report which was worked on by over 500 authors and 2,000 expert reviewers (International Panel on Climate Change, 2020). The report detailed the unequivocal warming of the planet and the underlying cause of this warming being human induced through the burning of fossil fuels (Pachauri, et al., 2007).

Public concern around the issue has been increasing with a significant rise seen globally since 2013 (Fagan & Huang, 2019). A 2019 poll taken in the UK, Canada, Germany, Italy, Brazil, France, Poland and the US illustrates how a majority of respondents see climate change as an emergency situation and think that global warming will soon pose an extremely dangerous threat (Taylor, 2019).

Politically however, the response has been lacking. In 1997 the Kyoto Protocol was adopted by 37 industrialised states, which set targets in each country for the reduction of greenhouse gas emissions (Childress, 2012). By the time the protocol came into effect in 2005, major emitters such as the US and Russia had already withdrawn due to the economic penalties that they believed would be put on developed nations (Childress, 2012). Due to the flaws and ineffectiveness of the Kyoto Protocol, the Paris Agreement was drawn up in 2015 which aimed at preventing global temperature increase of 2 °C above pre industrial levels with most nations currently missing these goals (Leahy, 2019).

Even with scientific consensus, international agreements on action and public concern increasing, global temperatures continue to tise (NASA, 2018), extreme weather events become more common as a result (Leifert, 2019) and major world leaders continue to dismiss the legitimacy of the crisis at hand (Feldman & Lavella, 2019).

So why is it that people are not acting? Why is it that governments haven't taken the responsibility to do what people are not, and stop contributing to the issue at hand? Kluger believes that people just don't care enough (Kluger, 2018). He explains how the consequences of climate change are traditionally thought of as being slow and too far into the

future for anyone to bother worrying about (Kluger, 2018). He highlights how it is also quite difficult to conceptualise how climate change will affect us personally, even for the most devout activists (Kluger, 2018). Perhaps David Wallace Wells will be able to help with this issue; "Whole countries like Bangladesh and parts of other countries like Miami will be underwater. Shortages of fresh water will affect humans and agriculture. The oceans will die, the air will get dirtier." (Wallace-Wells, 2019).

But perhaps more of the responsibility for action should lie with states as they possess far more power than people do at the individual level. Kamarck (2019) suggests several obstacles to progress in the politics of climate change (Kamarck, 2019). Including how we have trouble imagining the potential outfall that will happen after climate change, that we have trouble trusting in government which leaves only collective action as a solution and how people have trouble in understanding exactly what is causing the problem. She believes that governmental action is absolutely necessary in implementing taxes, regulations and treaty agreements but that this is very difficult with so many obstacles in place (Kamarck, 2019).

In this study I will investigate these obstacles, with a primary focus on the effects of public opinion on climate policy performance in the 28 EU member states. The EU was selected due to there being little research to date in this area although sufficient data is avilable. I will analyse data sourced from the Eurobarometer and Eurostat databases, by using multiple regression testing to determine the nature of this relationship. I will also consider alternative factors such as GDP, household income, education and fossil fuel dependency. This study will fill a gap in research by being one of the few investigate the relationship between public opinion and climate policy specifically, and by adding to the scarce research on climate change opinion in the EU. Future research could replicate the current study over a greater period of time or with a different block of countries. Accounting for more influential variables would also be beneficial such as political ideology and policy type. This study has implications in regarding the responsiveness of EU governments to the public and highlighting the political effort that has been undertaken to combat climate change.

Literature Review

According to a study conducted in 1983 on the relationship between public opinion and state policy, public opinion was the "proximate cause" of policy outcomes after a one year lag period in the US (Page & Shapiro, 1983). The researchers find that; "policy tends to move in the same direction as public opinion most often when the opinion change is large and when it is stable" (Page & Shapiro, 1983). The researchers also suggest other variables that play a role in the variation, such as type of policy issue, nature of political institutions and ideological direction but that public opinion has the majority of influence (Page & Shapiro, 1983).

A 2003 study based in the US found that public opinion has a substantial effect on public policy by using data from studies conducted in the period 1976 to 1997 and reviewing their collective findings (Burstein, 2003). The impact of opinion was found to be strong even when the activities of political organisations and elites are taken into account (Burstein, 2003).The researchers also noted that issue salience, activities of political organisations and time were important factors in this relationship (Burstein, 2003).

A study using data from the UK in the period from 1973 to 2006, also highlighted a causal relationship between public opinion and policy (Hakhverdian, 2012). The study examine whether changes in opinion leads to changes in policy, changes in policy lead to changes in opinion or changes in policy lead to changes in opinion in the opposite direction (Hakhverdian, 2012). It highlights that the relationship is directed this way more often than policy affecting public opinion (Hakhverdian, 2012).

More specifically, a 2018 study based in the US found that climate policy adoption was positively related to public opinion (Bromley-Trujillo & Poe, 2018). The researchers found that the more people that perceived climate change to be a problem and the more attention they paid to environmental issues, the more climate policy action the state displayed (Bromley-Trujillo & Poe, 2018). The authors concluded that; "it is clear from our analysis that issue salience is one of the driving forces behind climate policy adoption" (Bromley-Trujillo & Poe, 2018).

It seems that is not only that people need to be concerned about an issue to inspire policy change but that they must think that the issue is of great importance and maintain this concern for a long period of time.

As noted in these studies however, other factors have a part to play in this relationship. Economics appears to have the second largest role in climate policy performance with many states and individuals believing that climate policies are too expensive, having a negative opinion of them as a result. Developing nations have been shown to be much less willing to pay the costs of climate control policies when compared to developed nations (Allo & L. Loureiro, 2014). These findings arose after a review of 58 international studies that aimed to investigate preferences for climate change mitigation and adaptation policies throughout the world (Allo & L. Loureiro, 2014).

Developed nations however can still be unwilling to pay for climate policies as shown by a study that used 916 Swiss citizens as a sample while researching the determinants of consumers' willingness to support climate policy measures (Tobler, et al., 2012). Researchers found that people were less willing to pay for policies that imposed a high economic, effort or time costs favouring voluntary policies which makes the introduction of policies at a state level very difficult (Tobler, et al., 2012).

A similar study conducted in Canada using 1306 citizens, highlighted how people were much more likely to support regulatory and voluntary policies, 83% of respondents, and oppose carbon pricing policies, 47% of respondents (Rhodes, et al., 2017). They also found that being concerned about climate change, having trust in scientists and being female were factors associated with citizen support across all policy types that they looked at (Rhodes, et al., 2017).

Another study that took place in France in 2014 aimed to determine the factors behind consumer choice while investing in energy efficient technologies (Ameli & Brandt, 2015). Results show that income was a big predictor of investment with home-owners and high-income households more likely to spend the money for energy efficient appliances (Ameli & Brandt, 2015). Dietz at al. (2007) also found that people in higher income households had greater support for policies that would impose financial costs on American households.

Businesses also oppose the costs that climate policies can put on them as shown by the opposition that researchers found, to the promotion of climate policies by those with business interests (Harrison & Sundstrom, 2007). The Kyoto Protocol would be an example of such a policy (Harrison & Sundstrom, 2007). Public concern was found to increase and decrease as GDP did in the US in another study conducted in 2017 aimed at analysing the factors affecting public concern about the threat of climate change (Carmichael & Brulle,

2017). A similar result was found in study that analysed the UN's "Annex 1" countries, finding that GDP was a strong predictor of ambitious climate policy (Tobin, 2017). Another study shows that environmental performance improves with the wealth of a nation after analysing 71 countries (Etsy. C. & E. Porter, 2005).

Research has shown that education is also a predictor of support of climate change policy. Since the 1980's, there is evidence that education has had a role to play in people's perception of the importance of climate change (Howell & S.B., 1992). Education became the most important predictor of support for environmental policies during this time according to a study from 1992 (Howell & S.B., 1992). College educated respondents were more likely to believe that climate change exists in one study with 64% of college-educated respondents believing that it does exist and 50% of non-college-educated respondents believing that it doesn't exist (Lachapelle, et al., 2012). This relationship was more modest however than others the researchers discussed, such as party affiliation (Lachapelle, et al., 2012).

Researchers in a 2002 study were trying to understand the gap between people's awareness of environmental issues and the environmental behaviour that they exhibit (Kollmuss & Agyeman, 2002). They found that education played an important role in building knowledge of environmental issues (Kollmuss & Agyeman, 2002). This has changed however as more recent studies suggest that this relationship has been influenced by party membership. Surveys taken in a US study show that education increases environmental awareness but only with supporters of the Democrat party (Hamilton, 2011). The same relationship was negatively correlated with supporters of the Republican party (Hamilton, 2011).

A study carried out using a sample made up of Michigan and Virginia residents found that recognition of the consequences of climate change, general trust in scientists and less trust in industry were related to greater support for climate policies (Dietz, et al., 2007).

People who studied past the age of 20 are considerably more likely to find global warming or climate change a serious problem than those who finished their education at 15 (European Parliament, 2008).

Political ideology or affiliation and elite cues have also shown to influence public opinion. Climate change has become a partisan issue that is no longer based around the science. A study found that people became more polarised once they learned of elite cues in the US (Guber, 2013). Similarly to the study by (Hamilton, 2011), Republicans who believed

that they understood the climate issue were less likely to express concern on the issue while Democrats found to show the opposite attitudes (Guber, 2013). The researchers suggested that people only developed their stance on the issue when they learned the position of the party they support (Guber, 2013). This was supported in the previous study by Bromley-Trujillo & Poe (2018) who found that legislative chambers with Republican majorities were less likely to adopt climate policies. Another study suggests that party elites affect public concern on climate change in a different way. By increasing their activity related to the issue, the media pays more attention which is communicated to the public, raising their awareness and concern (Carmichael & Brulle, 2017).

In one of the few studies that wasn't conducted in the US, researchers found that respondents on the right, in 14 Western European countries and 11 former-Communist countries were less likely to believe that climate change is a serious problem, believe we should do something to deal with the problem, express personal willingness to pay for climate change measures or support policies that aim to reduce greenhouse gas emissions (McRight, et al., 2016). The researchers note however, that the European partisan divide is much weaker than in the US (McRight, et al., 2016). Another study based in Europe shows that public concern for climate change is highest when elites are united in their views (Sohlberg, 2016).

The fossil fuels a country uses or produces also tends to influence opinion on climate change policies. Reliance on carbon intensive industries such as coal and gas production was a strong predictor of weak climate policy adoption in the US (Matisoff, 2008). The researchers found that states were more likely to try to protect carbon intensive industries from emissions requirements than to cut down on their use (Matisoff, 2008). People from countries such as New Zealand, Australia, Norway and Sweden were found to be less likely to support a tax that is imposed directly on themselves and less likely to support in a country that is heavily dependent on the fossil fuel industry (Harring, et al., 2019).

From these studies we can see how results point to a causal relationship between the public opinion of a certain issue and the eventual policy outcome. It seems that the perceived importance of the issue, issue salience, is one of the most important factors in deciding what policies end up looking like and how quickly they come into being. These insights appear to be true of both policies in general and climate policy more specifically although the majority of this research had been conducted in the US which may create problems when generalising.

A stable level concern over a long period of time is also a key factor in determining whether opinion can affect policy or not.

H1: As public opinion of climate change increase, so will climate policy performance.

However, economics, education, political affiliation and natural resource use most often arise in the literature as confounding factors that have a role to play in the relationship between the public opinion of climate change and climate policy outcome.

On an individual level, people are less willing to support climate policy that incur a high cost on themselves, often seeing the policies as being too expensive and not worth the cost. We can see that on a nation-level, GDP can be a strong predictor of climate policy performance, perhaps because states will tend to see other areas of expenditure as being more important during tough economic times. Business interests also stand in the way of climate policy, often refusing to incur the costs that climate policies will place on trade. These factors must be considered in combination when determining the relationship between public opinion and climate policy performance at the state level.

With issue salience playing an important role in the opinion – policy relationship, education about the severity of the climate change problem could act as a strong aid for improving salience. It has been shown that higher education levels predict perceived importance of climate change especially in those that attain a college education or higher. It has also been shown however, that this increase in education does not always increase people's pro environmental behaviours. People of the right tend to be sceptical of science, so education does not predict more concern with them, as it does with people on the left.

Particularly in the US, political affiliation has had a large effect on the opinion of people around climate change. People on the right were less likely to believe in climate change or support policy, while people on the left were more likely. Ultimately however, individuals only decided their position when they learned of the position of the party they support. Outside the US, European respondents on the right were less likely to express support for climate polices but the divide was much less divisive than in the US.

Finally, nations that have a high dependence carbon intensive industry were more likely to try and protect the industry rather than accept climate policies such as emissions requirements.

Alongside the main hypothesis of this study, a number of other relationships can also be expected. Climate policy performance is expected to be positively correlated with GDP, household income levels, education levels and low industrial dependency on fossil fuels. Opinion is expected to be positively correlated with GDP, household income levels, education levels, affiliation with the political right and residing in a country with a low level of industrial fossil fuel dependency.

Methodology

During the preliminary work for this project, an area for research had to be chosen. Due to personal interest and the fact that it is such a great and current issue, climate politics was decided on as a general area of inquiry. Previous knowledge of databases such as Eurostat and the Eurobarometer survey then proved quite useful as it provided a wide array of data that could be used with many avenues to investigate the topic of climate policy. It also provided an advantage as it contained data that could not possibly have been collected independently due to the small scope of this project. With an understanding of the data that was available, research into climate politics began and a relationship was quickly decided on. Sources were mostly found in articles from scientific journals with some media reports also looked at. Once the variables of interest were identified, being public opinion of climate change, gross domestic product, household income levels, educational attainment levels, political ideology and industrial fossil fuel dependency, data had to be found to measure each factor as accurately as possible. With a review of the previous literature conducted, hypotheses were formed, and data collection begun.

Data has been collected from numerous locations and where overlapping years of data was available analysis was conducted. This overlap was evident from 2013 to 2017. For this reason, only certain datasets were of use even though there may be many more that take similar or more accurate measurements.

To quantify each nation's score on climate policy performance, a sub section of the Climate Change Performance Index (CCPI) was used. The CCPI is published annually by GermanWatch and intends to act as an independent monitoring tool in international climate politics (GermanWatch, 2019). It has been published since 2005 and is put together with the help of over 350 climate and energy experts from the country's civil societies (GermanWatch, 2019). The used in this study is the "climate policy" section of the index

(GermanWatch, 2019). This section consists of questionnaires on national and international climate policy and accounts for 20% of the overall score given by the CCPI (GermanWatch, 2019). The national policy section covers policies on promotion of renewable energies, increasing energy efficiency and other measures to reduce greenhouse gas emissions in the electricity and heat production sector, manufacturing and construction industries and transport and residential sectors (GermanWatch, 2019). Current national policy is also scored according to reduction in deforestation and protecting forest ecosystem biodiversity, and national peat land protection (GermanWatch, 2019). With each of the policy areas the strengths and level of implementation of each policy framework are scored (GermanWatch, 2019). Finally, experts score the ambition level of each nation according to their Nationally Determined Contributions promised to the United Nations Framework Convention on Climate Change, and based on their compatibility with the well-below-2°C target set by the Paris Agreement (GermanWatch, 2019). The unit for this variable is the total number of points that each country received for the policy section of the CCPI.

The Eurobarometer survey has been published since 1973, regularly assessing citizens perceptions and expectations towards the EU (European Parliament, 2020). It covers a variety of areas such as European elections, public views of the European Parliament and some specific topics of special importance such as climate change or economic situation (European Parliament, 2020). The results of these surveys are also brought to plenary sessions, where members are presented with a selection of current results relating to the topics up for debate in that session (European Parliament, 2020). One question in particular was of interest for this study. The survey asks participants to detail what they perceive to be the most important issue facing their country at that time, with answers ranging from climate change to foreign policy, and economic situation to immigration (European Parliament, 2020). Throughout the years this study is focusing on, the possible responses relating to climate change were altered. They

responses varied from “the environment”, “the environment, climate and energy issues” and “protecting the environment” (European Parliament, 2020). Although the wording of the response changed throughout the years, there was no years where data was recorded in more than one response category. The data used in this study is taken from the response category that was available for each year. The unit used for this variable is the percentage of responses that the categories discussed above received and will be called “public opinion”.

Eurostat is the statistical office of the European Union and is aimed at providing high quality statistics throughout the EU that allow countries to be compared across a number of areas (Eurostat, 2020). GDP is used as an indicator of a countries economic situation and is calculated by taking the total value of goods and services used in a country from the total value of all goods and services produced in the country (Eurostat, 2020). The data used in this study was sourced from the “national accounts” section of the Eurostat website. It is commonly used for economic analysis, forecasting and policy design (Eurostat, 2020). The data for GDP was in millions of euro and was divided by 1000 for easier interpretation. This variable will be called “GDP”.

Similarly, household income data is taken from the Eurostat website. In their “income and living conditions” section, they measure people at risk of poverty, social exclusion, income distribution and monetary poverty (Eurostat, 2019). Eurostat define a household as; “a person living alone or a group of people who love together in the same private dwelling and share expenditures, including the joint provision of the essentials of living” (Eurostat, 2019). To calculate household income, the income of each member of the household is summed together plus income at a household level (Eurostat, 2019). This includes all income from work, private income from investments, transfers between households and all social transfers including pensions (Eurostat, 2019). This figure is then equivalised to take into

account the impact arising from differences in household size and composition (Eurostat, 2019). The figures were then divided by 100 and named “household”.

Eurostat also provide data on education attainment alongside age and sex. The attainment levels are divided into primary and lower secondary, upper secondary and post-secondary non-tertiary education, and tertiary education (Eurostat, 2020). The attainment categories used in this data are based on the classifications from the International Standard Classification of Education (Eurostat, 2020). The tertiary section is the equivalent of a bachelors’ degree or higher and is of most interest for the purpose of this study (Eurostat, 2020). The number of students in tertiary education was then found as a percentage of the countries’ population to account for differences in population size between countries (Eurostat, 2020). The unit for this variable, is the percentage of the population with a bachelor’s degree or higher and will be named “education”.

The material flow accounts recorded by Eurostat were used to measure the fossil fuel dependency of each nation. The dataset provides detailed accounts of the materials that flow into and out of an economy (Eurostat, 2020). The types of materials are broken down into various categories such as biomass, metal ores and fossil energy materials/carriers (Eurostat, 2020). The fossil energy category is of most interest for this study. The data was measured in thousand tonnes of fossil energy carriers per year and was then divided by 100. This variable will be called “fossil fuel”.

Previous literature suggests that a relationship between political ideology and climate change policy exists. This seems true at both national and individual levels. After exploring the datasets that could be used to measure this variable, it was decided that there was too much variance in what years and countries data was available for, to be able to test this relationship alongside the rest of the variables. The Manifesto Project analyses party’s

election manifestos as a way of aiding the study of party's policy preferences and their data seemed like the most appropriate for use in this study, however due to an inadequate amount of data available during the years of interest, the decision was made to exclude this variable (ManifestoProject, 2020).

Possible datasets were identified that could be used to measure each of the variables identified during the literature review. Each set was downloaded and analysed to determine how fit they were for comparison. Issues arose when it was realised that it would be difficult to locate data sets taken from the same block of years. The Eurobarometer survey provided the most complete source, but the time frame used for datasets on the Eurostat website varied. Another consideration was deciding what units of measurement would be of most relevance for use in this study as each dataset from Eurostat provided a number of units. If units like GDP were not adjusted for example, interpretation would be difficult due to the scale of the figures being observed. Once datasets were identified that would measure the variables and be available for a common block of years, the data was compiled for use with statistics package, Statistical Package for the Social Sciences (SPSS). SPSS was chosen due to previous knowledge of its use but also as it could perform the analysis necessary for this study.

The data was downloaded from each online source, the years and countries of interest were selected and copied into a final dataset for use in the study. A variable was added to code countries from 1 – 28 in alphabetical order with a number of dummy variables created for both the years and countries used. Each variables was scaled appropriately to enhance interpretation.

A hierarchical linear regression approach was chosen as it is a method of predicting a dependent variable from two or more independent variables (Field, 2013). Hierarchical

regression analysis requires variables to be selected on a theoretical basis as it operates on the assumption that a linear relationship will be present and therefore does not work well with random variables (Field, 2013). A hierarchical regression means that the variables are imputed into the model in order of their theoretical importance (Field, 2013).

Once the analysis method had been decided, SPSS was used look at the descriptive statistics of the data set. The tables were analysed, and the means, medians and spreads were discussed to get an early perspective on the data. A correlation table was then constructed which provided a preliminary look at the relationships in question. This table also provided a way of checking for multicollinearity which would be further tested after the regression tests. A scatterplot was constructed showing the relationship between the variables of most interest, being policy performance and public opinion. Finally, histograms and a standard error table were made to assess the spread of the variables.

A regression test was then run using the policy performance and public opinion variables. The model summary table shows the R^2 value, which highlights how much of the variance in policy performance could be accounted for due to the variance in public opinion (Field, 2013). The ANOVA table gives a significance score for the R^2 value while the coefficients table displays the unstandardized coefficients table (Field, 2013). The significance scores tell us whether our results are statistically significant while the unstandardized coefficients tell us how many units of change to expect in the dependent variable based on one unit of change in the dependent variable (Field, 2013). The standardised coefficients section also allows use to directly compare the beta values of each variable and determine what proportion of the effect that each exhibits (Field, 2013). Other figures are also available from these tables but are of little interest for the purpose of this study. A second regression test was run to include both public opinion and GDP. The variables were added in this order due to the hierarchical approach taken. The figures

discussed above were analysed for the second model and the process was repeated for all remaining variables until a model was completed that included all independent variables. One final regression test must be run which incorporates the country and year dummy variables to account for unobserved country and year related factors.

Following the regression models, bias in the model must be assessed by testing for the assumptions of regression testing. These assumptions test whether or not we can take the p value associated with a model as being accurate and interpret it accordingly (Field, 2013). The assumptions are of linearity, homoscedasticity, independence and normality (Field, 2013). Linearity and homoscedasticity are analysed using a plot of standardised residuals against standardised predicted values (Field, 2013). The graph should display an array of dots in a shot gun like pattern for homoscedasticity with data points equally spread around 0 on both the x and y axis (Field, 2013). For linearity the data must not show any obvious curve (Field, 2013). Independence of observations is assessed using the Durbin Watson test. A Durbin Watson $D > 1.5$ or $D < 2.5$ means that the data does have independence of observations (Field, 2013). Finally, normality is tested by creating a histogram and normal probability plot for the residuals of the data (Field, 2013). A histogram should appear like a normal distribution and the normal probability plot is further evidence of this if the dots are aligned closely with the line that is displayed through the graph (Field, 2013).

On completion of the statistical analyses, the results were interpreted to determine whether public opinion displayed a significant relationship to climate policy performance in the EU. Additionally, the influence that public opinion has on climate policy performance in comparison to the remaining independent variables was also assessed. The results were also analysed to decide if the data supported the expected relationships between the independent variables detailed in the literature review.

Time was then taken to relate the findings to previous literature and also to the broader political world. Limitations, suggestions for future research and concluding remarks were added.

Results

Descriptive Statistics

		CCPI	Opinion (%)	GDP/1000	Household/100	Education (%)	Fossil Fuel
N	Valid	140	140	140	140	140	140
	Missing	0	0	0	0	0	0
Mean		9.1091	7.3714	521.1132	159.0275	27.4529	579.4020
Median		8.8750	5.0000	179.9654	147.0700	28.4000	238.4830
Std. Deviation		4.17595	7.69784	794.06673	85.94375	7.08777	865.49363
Minimum		1.39	.00	7.65	27.42	13.80	10.87
Maximum		20.00	32.00	3244.99	416.32	40.40	4414.86

Table 1

- CCPI measures climate policy performance and is scored from 1 – 20.
- Opinion measures public concern for climate change and is represented as a percentage of the Eurobarometer respondents that thought of the environment or climate as the most important issue facing their country.
- GDP is a commonly used economic indicator for states and has been divided by 1000.
- Household measures mean household income levels and had been divided by 100.
- Education measures the education levels in a country by calculating the number of people with a bachelor's degree or higher as a percentage of the whole population.
- Fossil fuel measures a countries industrial fossil fuel use.

Table 1 gives the first idea of how the data may look. There is 140 data points for each variable ranging through 5 years and 28 EU member states. There is likely no outliers in the variables CCPI, opinion, household income or education as the means and medians are close. GDP and fossil fuel use on the other hand display quite different means and medians with a difference of 341.1478 and 340.919 respectively, indicating that outliers may exist. This will be assessed further in later tests.

Figure 1

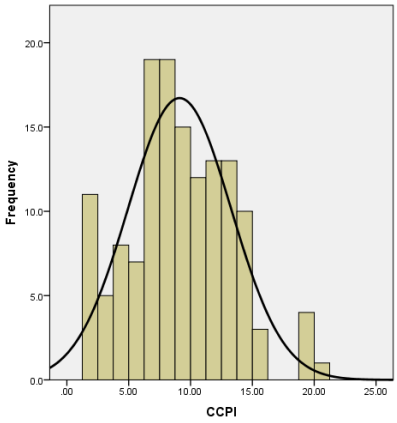


Figure 2

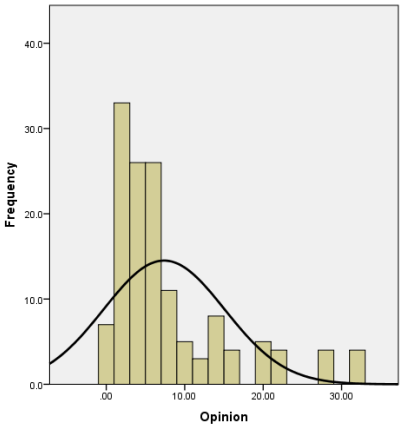


Figure 3

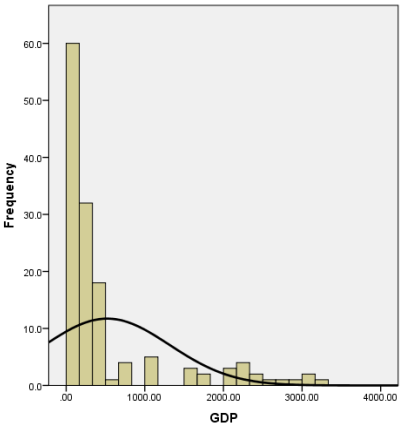


Figure 4

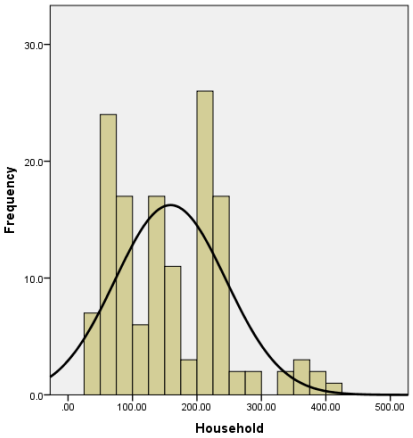


Figure 5

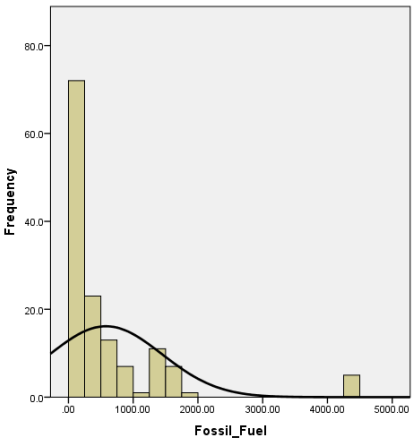
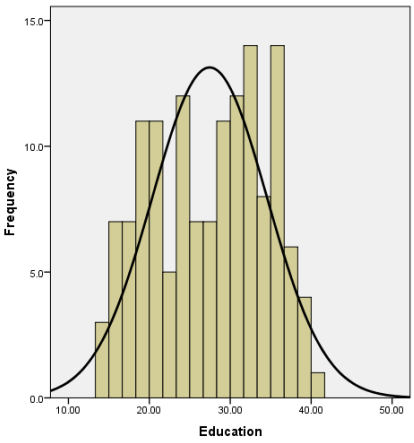


Figure 6



Standard Deviation and Standard Error

	Mean		Std. Deviation
	Statistic	Std. Error	Statistic
CCPI	9.1091	.35293	4.17595
Opinion	7.3714	.65059	7.69784
GDP	521.1132	67.11089	794.06673
Household	159.0275	7.26357	85.94375
Education	27.4529	.59903	7.08777
Fossil Fuel	579.4020	73.14756	865.49363

Table 2

The figures above show the distributions of both the dependent and independent variables. CCPI, opinion, household and education appear to be normally distributed around the mean. The GDP and fossil fuel variables display moderate right skews and appear to be distributed more asymmetrically. The standard errors of the mean support these distributions further, with CCPI, opinion and education having low standard errors of .353, .651 and .6

respectively. Household is slightly higher at 7.264 while GDP and fossil fuel are much higher at 67.111 and 73.148.

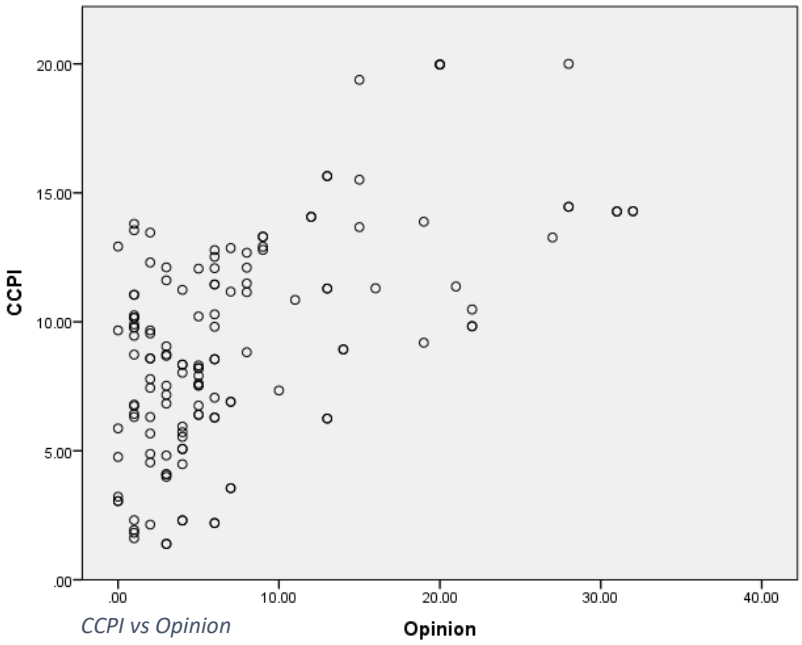
Correlation Table for all Variables

		CCPI	Opinion	GDP	Household	Education	Fossil Fuel
Pearson Correlation	CCPI	1.000	.581	.232	.276	.196	.221
	Opinion	.581	1.000	.129	.418	.194	.128
	GDP	.232	.129	1.000	.108	-.148	.108
	Household	.276	.418	.108	1.000	.386	.100
	Education	.196	.194	-.148	.386	1.000	-.104
	Fossil Fuel	.221	.128	.108	.100	-.104	1.000
Sig. (1-tailed)	CCPI	.	.000	.003	.000	.010	.004
	Opinion	.000	.	.065	.000	.011	.065
	GDP	.003	.065	.	.103	.040	.102
	Household	.000	.000	.103	.	.000	.119
	Education	.010	.011	.040	.000	.	.110
	Fossil Fuel	.004	.065	.102	.119	.110	.

Table 3

Table 2 displays the correlations between each of the variables and their correlations with themselves and each other variable. This table is promising as it is an early indicator that a strong positive relationship exists between CCPI and public opinion with a Pearson correlation of r = .581 and a significance level of p = .000. Further results show that the remaining independent variables are all positively related to CCPI at a significance level of .05. This table also shows that the most likely variables to show multicollinearity are household income and public opinion as they show a correlation of r = .418 at p = .000. The remaining variables show much smaller correlations with each other, but multicollinearity will be tested further in later tests. From this table, the hierarchical order for imputing variables into later regression tests can also be supported or challenged. From the literature review, the theoretical importance of variables in descending order was, opinion, GDP, household income, education and fossil fuel use. However due to the correlations of each variable with CCPI, this table would suggest that the order should be opinion, household income, GDP, fossil fuel use and then education.

Figure 7



CCPI vs Opinion

Figure 1 shows the moderate positive relationship between CCPI and opinion. As expected, a rise in opinion corresponds with a rise in CCPI.

Summary of Model 1 (Opinion)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.581[a]	.338	.333	3.41124

Table 4

ANOVA Table for Model 1 (Opinion)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	818.116	1	818.116	70.306	.000[b]
	Residual	1605.847	138	11.637		
	Total	2423.963	139			

Table 5

Coefficients Table for Model 1 (Opinion)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	6.786	.400		16.971	.000	5.995	7.577
	Opinion	.315	.038	.581	8.385	.000	.241	.389

Table 6

Model 1 includes only the opinion variable as it is thought to be the most influential factor in determining CCPI. Opinion can account for 33.8% of the variance in CCPI and this result is significant at p = .000. A 1% change in opinion will result in between a 0.241 and 0.389 change in CCPI scores and this result is significant at p = .000.

Summary of Model 2 (Opinion, GDP)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.602[a]	.363	.353	3.35806

Table 7

ANOVA Table for Model 2 (Opinion, GDP)

Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	879.072	2	439.536	38.978	.000[b]
	Residual	1544.891	137	11.277		
	Total	2423.963	139			

Table 8

Coefficients Table for Model 2 (Opinion, GDP)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
2	(Constant)	6.430	.422		15.225	.000	5.595	7.265
	Opinion	.304	.037	.560	8.147	.000	.230	.378
	GDP	.001	.000	.160	2.325	.022	.000	.002

Table 9

Model 2 includes both the opinion and GPD variables. This model can account for 36.3% of the variance in CCPI scores at p = .000. A 1,000,000 euro change in national GDP levels results in a CCPI change of between 0.000 and 0.002 at p = .000.

Summary for Model 3 (Opinion, GDP, Household Income)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3	.603[a]	.363	.349	3.36835

Table 10

ANOVA Table for Model 3 (Opinion, GDP, Household Income)

Model		Sum of Squares	df	Mean Square	F	Sig.
3	Regression	880.933	3	293.644	25.881	.000[b]
	Residual	1543.031	136	11.346		
	Total	2423.963	139			

Table 11

Coefficients Table for Model 3 (Opinion, GDP, Household Income)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
3 (Constant)	6.249	.616		10.139	.000	5.030	7.468
Opinion	.297	.041	.548	7.244	.000	.216	.378
GDP	.001	.000	.158	2.289	.024	.000	.002
Household	.001	.004	.031	.405	.686	-.006	.009

Table 12

Model 3 includes opinion, GDP and household income variables and can account for 36.3% of the variance in CCPI at p = .000. A 1,000 euro change in household income results in a CCPI change of between -0.006 and 0.009.

Summary for Model 4 (Opinion, GDP, Household Income, Education)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	.613[a]	.376	.357	3.34730

Table 13

ANOVA Table for Model 4 (Opinion, GDP, Household Income, Education)

Model		Sum of Squares	df	Mean Square	F	Sig.
4	Regression	911.369	4	227.842	20.335	.000[b]
	Residual	1512.594	135	11.204		
	Total	2423.963	139			

Table 14

Coefficients Table for Model 4 (Opinion, GDP, Household Income, Education)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
4	(Constant)	4.567	1.190		3.837	.000	2.213	6.921
	Opinion	.293	.041	.540	7.178	.000	.212	.374
	GDP	.001	.000	.183	2.601	.010	.000	.002
	Household	-.001	.004	-.017	-.212	.832	-.009	.007
	Education	.073	.044	.124	1.648	.102	-.015	.161

Table 15

Model 4 includes the variables, opinion, GDP, household income and education. This model accounts for 37.6% of the variance in CCPI scores at p = .000. As p = .102, the beta score for education is not significant.

Summary of Model 5 (Opinion, GDP, Household Income, Education, Fossil Fuel)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	.631[a]	.399	.376	3.29831

Table 16

ANOVA Table for Model 5 (Opinion, GDP, Household Income, Education, Fossil Fuel)

Model		Sum of Squares	df	Mean Square	F	Sig.
5	Regression	966.196	5	193.239	17.763	.000[b]
	Residual	1457.768	134	10.879		
	Total	2423.963	139			

Table 17

Coefficients Table for Model 5 (Opinion, GDP, Household Income, Education, Fossil Fuel)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
5	(Constant)	3.962	1.203		3.293	.001	1.583	6.342
	Opinion	.284	.040	.524	7.033	.000	.204	.364
	GDP	.001	.000	.174	2.504	.013	.000	.002
	Household	-.002	.004	-.034	-.430	.668	-.009	.006
	Education	.088	.044	.149	1.981	.050	.000	.175
	Fossil Fuel	.001	.000	.154	2.245	.026	.000	.001

Table 18

Model 5 includes the variables, opinion, GDP, household income, education and fossil fuel an accounts for 39.9% of the variance in CCPI at p = .000. A 100 tonne change in fossil fuel use results in a change of between 0 and 0.001 in CCPI scores.

Summary for Model 6 (Predictor Variables and Dummy Variables)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
6	.916[a]	.839	.782	1.94828	1.781

Table 19

ANOVA Table for Model 6 (Predictor Variables and Dummy Variables)

Model		Sum of Squares	df	Mean Square	F	Sig.
6	Regression	2032.998	36	56.472	14.878	.000[b]
	Residual	390.965	103	3.796		
	Total	2423.963	139			

Table 20

Coefficients Table for Model 6 (Predictor Variables and Dummy Variables)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	18.073	5.868		3.080	.003	6.435	29.711
	Opinion	.230	.065	.424	3.554	.001	.102	.358
	GDP	.001	.000	.123	2.132	.035	.000	.001
	Household	-.010	.005	-.210	-2.239	.027	-.019	-.001
	Education	-.124	.179	-.211	-.693	.490	-.479	.231
	Fossil Fuel	-.005	.004	-1.057	-1.257	.212	-.013	.003

Table 21

Model 6 includes all independent variables and both the country and year dummy variables and accounts for 83.9% of the variance in CCPI scores at p = .000.

Figure 8

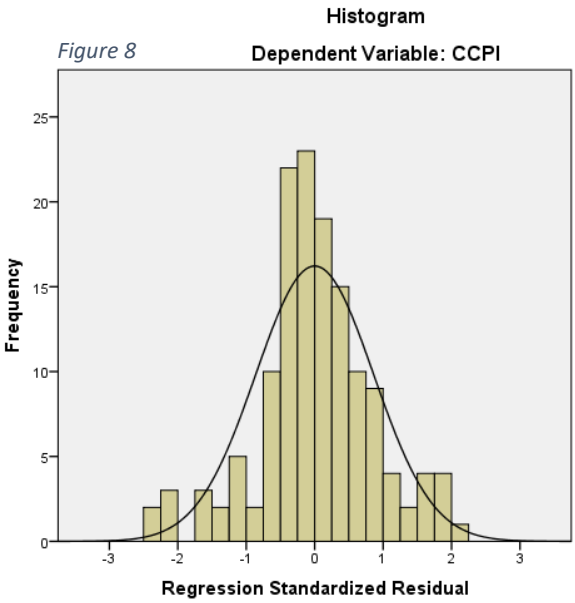


Figure 9

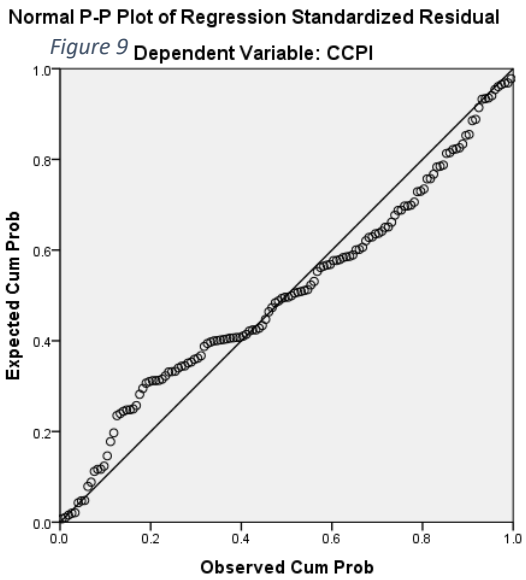
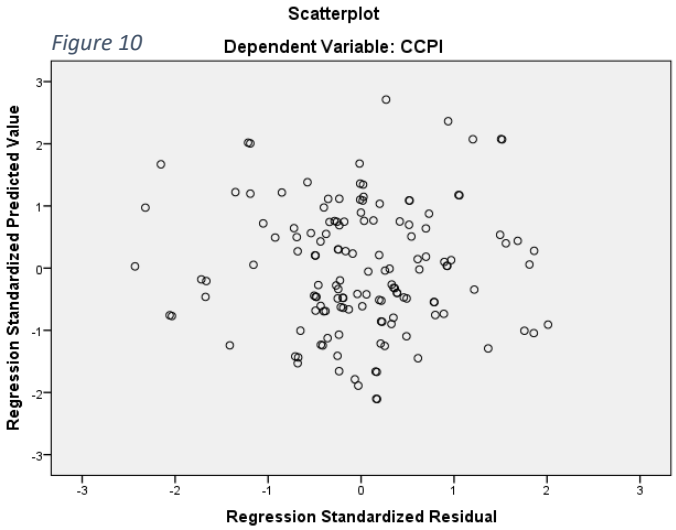


Figure 10



The histogram displays a normal distribution of the residuals as does the shape of the normal probability plot. The scatterplot shows that the data has homoscedasticity as the points are dotted proportionately around 0 on both the x and y axis. Finally, the data has independence of observations as in table 18, the Durbin Watson D = 1.03 and is within the required range.

Discussion

The literature review displays the previous knowledge that existed on the predictors of national climate policy. This study was interested primarily on the effect that public opinion of climate change has on climate policy performance in the 28 EU member states. The alternative national predictors accounted for were, GDP, household income levels, education levels and fossil fuel use. These variables were chosen due to the previous literature suggesting that they play an important role but also based on the availability of data. Once data sources were compiled into a final dataset, multiple regression testing was conducted to assess the relationships that exists. Finally, dummy variables were included in the regression model to account for unobserved country and year factors.

The results have shown that public opinion of climate change is a much greater predictor than any of the other 4 variables discussed. The initial Pearson correlation between public opinion and policy performance was r = .581 which was at least double the strength of the next strongest correlation. Additionally, the standardised coefficients in model 6 displayed a beta value of .424 for opinion which was larger than the other significant predictors, GDP and household income levels, by .301 and .634 respectively. In the regression tests, model 1 was run with just public opinion as the independent variable and accounted for 33.8% of the variance in CCPI. The subsequent models accounted for one more independent variable each time but only increased the variance accounted for to 39.9% as seen in model 5. This shows that out of the variables included in this study, public opinion was the greatest predictor of climate policy performance in the EU during the years 2013 – 2017.

The previous literature also supports a majority of the findings in this study. Firstly, the result that public opinion of the threat of climate change is related to climate policy performance is most greatly supported by the findings of Bromley-Trujillo & Poe (2018) as the researchers also looked into the relationship of public opinion and climate policy specifically. There is also more broad support however for the relationship between public opinion and policy in general (Page & Shapiro 1983, Burstein 2003, Hakhverdian 2012, Bromley-Trujillo & Poe 2018, Rhodes, et al., 2017). The current study sheds new light on this relationship by highlighting the level of influence that public opinion has on climate policy performance.

Nationally, GDP, household income and education levels were expected to be positively related to climate policy performance (Tobin, 2017, Etsy. C. & E. Porter, 2005, Ameli & Brandt, 2015, Dietz, et al., 2007, Howell & S.B., 1992, Lachapelle, et al., 2012). In table 2, the Pearson correlations support these previous findings with correlations of .232, .276 and .196 respectively, all at the .05 level of significance. The literature review also suggested that climate performance should be negatively related to fossil fuel use (Matisoff, 2008, Harring, et al., 2019) but surprisingly, the results of this study show otherwise, with a weak but positive relationship of .221 at p = .004.

Additionally, public opinion was expected to be positively correlated to GPD, household income and education (Carmichael & Brulle, 2017, Dietz, et al., 2007, Howell & S.B., 1992, Lachapelle, et al., 2012). These expectations were supported with correlations of .129, .418 and .194 respectively, although only household income and education were found at the .05 level of significance. It was also expected that public opinion would be negatively correlated with fossil fuel use (Harring, et al., 2019) but this was not evident from the results. A weak but positive correlation was found with r = .221 and p = .004.

Some limitations of this study are more prominent than others. Firstly, the exclusion of predictors that are thought to be relevant such as politcal ideology (Page & Shapiro, 1983 Guber, 2013, Hamilton, 2011, Sohlberg, 2016) undermine the effect that the results appear to show. A main facet of this study also hinges on the study by Page & Shapiro (1983), which may have lost its relevance due to the length of time since it was published and the changes in the political landscape since then. Another limitation is that the direction of the relationship that the main hypothesis tries to explain is unclear due to the tesing that was conducted. The sample sized used was also on the smaller side necessary for effective regression tesing which could compromise the reliability of the results. On a global scale, the EU is likely to be more responsive to public opinion in general when compared to dveloping countries or less democratic countries which would cause isses were generalising. Regression model 5 accounted for only 39.9% of the variance in CCPI scores which shows that quite a large amount of variance is yet to be explained.

To build on this study, replications could look at these factors over a different period of time. Perhaps times of recession, war or other emergency situations could affect the concern that individuals and the state will give to climate change. To add to this, future studies could build more longitudinal datasets for these variables with multiple countries, as

the previous work has focused more on short term single state analyses. The interaction effects of the independent variables could also be studied to gain a better insight into the level of effect that each individual or combination of factors has. To add a qualitative element to this work, case studies could be conducted into counties of interest, such as those that the hypothesis explains, by detailing what political events were occurring at the time that the data was taken. This would provide further support for the theory of this studies by linking the data to actual events. Additionally, new independent variables could be added to account for factors that the current study was unable to.

Political ideology is one obvious variable as it appeared a number of times during the research for this study (Page & Shapiro, 1983, Guber, 2013, Hamilton, 2011, Sohlberg, 2016). Ideology may be far more important in the US debate due to the partisan nature of US politics, but it would also be of interest to determine its effects in EU climate politics. Research could identify ideological effects within a group of countries on climate politics and then compare the findings for a number of ideologically similar blocks of countries such as the EU and the US. Another interesting factor would be how the types of policies that states try to implement effects how easily the policy is accepted by the public. Studies have found that polices imposing costs directly on the public are much less likely to gain public support or be accepted as policy (Harring, et al., 2019, Tobler, et al., 2012). The medias role in the climate policy performance is also in question. Carmichael & Brulle (2017) notes the effect that politicans cues have on the attention that media gives to certain topics. The effect of this media attention, whether mmotivated by elite cues or not, could also be investigated especially in the cases where outlets are state controlled or climate-skeptic. The role of business interests is also imprtant in climate policy performance (Harrison & , 2007). Businesses need to avoid the costs of climate policies could be influential, especially in nations where lobby groups have a great deal of power in politics. At the individual level, trust in science (Dietz, et al., 2007, Rhodes, et al., 2017), gender (Rhodes, et al., 2017) and age (European Parliament, 2008) have been pointed out as predictors for climate concern but their effects are not deeply understood. Further work could investigate more demographic factors for climate concern.

Conclusion

Through the results of the regression analyses conducted in this study, public opinion has been shown to be significantly related to climate policy performance in the EU. Not only has this been determined, but the comparative influence of public opinion has shown to be greater than GDP, household income, education and fossil fuel dependency. The study has shown that GDP and household income are also significant predictors of climate policy performance albeit showing rather small impacts. Multiple regression analyses were conducted for the purpose of this study, using data sourced from the Eurobarometer survey and Eurostat. The study adds to the previous literature on public opinion and policy in the EU in general but also more specifically to climate policy. It is also a part of the scarce research conducted on the relationship between public opinion and climate policy in the EU.

Future research could look deeper into the relationship discussed in this study by including new variables, increasing the time and country range that data is collected for, look at the interaction effects between variables or conduct qualitative case studies into the countries that are explained by the current model.

The findings are of importance for the public and policy makers alike. The results should inspire confidence in the public of the EU as they show that expressing concern about the issues that they care about will lead to changes in policy. This is particularly encouraging in the face of a threat as grave as climate change. It also shows policy makers that climate policy is something that the public of the EU cares about and will support, sometimes regardless of economic situations. The study also shows that despite the obstacles that climate politics has faced in the past such as the Kyoto Protocol, change is occurring and governments are acting on peoples concern.

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