

## Original Research Reports

# How Many Ways to Say Goodbye? The Latent Class Structure and Psychological Correlates of European Union Sentiment in a Large Sample of UK Adults

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## Abstract

Most psychological research on Brexit categorises participants as either leave or remain supporters. In the current study we take a data-driven approach and identify different clusterings of attitudes towards the European Union (EU) using latent class analysis (LCA), as well as how these classes differ across a range of important social and psychological variables. This analysis revealed 10 distinct classes of voters in a large (N = 15860) adult sample of UK citizens using data from the British Election Study. These classes ranged from being quite uniformly pro- or anti-EU in sentiment, to more mixed groups with more complex patterns of attitudes. The classes that included majority-remain supporters were younger and better educated, and self-rated more highly on the measures of actively open-minded thinking, openness, political trust, and external locus of control. The classes that included majority-leave supporters were older and less well educated, and self-rated more highly on the measures of authoritarianism and conscientiousness. However, there were also notable demographic and psychological differences within the classes associated with leavers and remainers. A full consideration of these attitudinal nuances will be necessary to achieve a deeper understanding of why the UK decided to leave the EU.

*Keywords:* latent class analysis, Brexit, authoritarianism, Big Five personality, actively open-minded thinking, political trust

## Non-Technical Summary

### 1. Background

On June 23rd 2016 the United Kingdom (UK) – via an advisory referendum – voted to leave the European Union (EU). Perhaps unsurprisingly, there has been considerable interest concerning the demographic and psychological traits associated with ‘leavers’ vs ‘remainers’. Much of the research and public discourse around Brexit has since adopted this dichotomized framework. However, this approach is almost certainly an oversimplification of the general public’s views towards the EU.

### 2. Why was this study done?

We wanted to examine whether attitudes towards the EU were more nuanced than this simple dichotomy. For example, perhaps there are individuals who are generally supportive of the EU, but opposed to the EU on specific issues such as immigration or sovereignty. Or perhaps there are individuals who are generally opposed to the EU, but value features such as its ability to minimize war. We also wanted to see whether these different ‘types’ of EU supporters could be distinguished on a range of demographic (e.g. educational attainment) and psychological (e.g. personality traits) characteristics.

### 3. What did the researchers do and find?

We used a large dataset (>15k individuals) from the British Election Study and a statistical technique called latent class analysis to determine how many ‘types’ of EU supporter exist in the general public. We found that 10 types of EU supporter were present in the data, roughly split across leavers and remainers. Some of these types were staunchly pro- or anti-EU across a range of issues. Others were more nuanced. For example, one of our types characterised individuals who were pro-immigration, but who also believed that the EU created more red-tape and were dissatisfied with EU democracy. A number of demographic and personality variables were strongly associated with some of these different EU types. The classes that included majority-remain supporters were younger and better educated, and self-rated more highly on measures of actively open-minded thinking, openness, political trust, and external locus of control. The classes that included majority-leave supporters were older and less well educated, and self-rated more highly on measures of authoritarianism and conscientiousness. However, there were also notable demographic and psychological differences within the classes between remain classes, and between leave classes.

### 4. What do these findings mean?

These findings tell us that viewing Brexit through a simple leave vs remain lens misses much of what people think about the EU, as well as the demographic and psychological characteristics that are related to these EU attitudes. If we want to gain a richer, more complete understanding of the reasons why the UK voted to leave the EU we will need to understand not just what caused people to vote leave or remain, but understand the demographic and psychological factors associated with different clusters of attitudes towards the EU.

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On June 23<sup>rd</sup> 2016 the United Kingdom (UK) – via an advisory referendum – voted to leave the European Union (EU), with 51.9% in favour of leaving and 48.1% in favour of remaining. The political, economic, and social implications are yet to be fully understood and it will likely take many years for an accurate assessment to be made. Nonetheless, it is hard to question that the consequences for both the UK and the EU are significant in a variety of ways, not least the current uncertainty with regard to citizenship, employment, and human rights, international trade agreements, and economic performance.

Perhaps unsurprisingly, then, there has been considerable interest concerning the demographic and psychological traits associated with ‘leavers’ vs ‘remainers’. For example, [Hobolt \(2016\)](#) reported that support for Brexit was particularly common among less-educated, poorer, and older voters. Similar findings were observed by [Zhang \(2018\)](#) who also reported that older individuals and those with lower levels of education were more likely to have voted to leave. And [Lee, Morris, and Kemeny \(2018\)](#) observed that citizens who were born in the UK were slightly more likely to vote leave if they lived in an area experiencing relative economic decline or had seen an increase in migrant populations.

With regards to psychological characteristics, [Steenbergen and Siczek \(2017\)](#) recently reported a positive association between a measure of right-wing authoritarianism and support for Brexit (controlling for a range of socio-demographic factors, including education and socio-economic status). Relatedly, [Swami, Barron, Weis, and Furnham \(2018\)](#) reported that a greater belief in Islamophobic conspiracy theories and higher levels of Islamophobia were predictive of support for Brexit. And [Steenbergen and Siczek \(2017\)](#) found that supporters of Brexit were higher in a measure of risk taking.

In sum, then, there are a range of demographic and psychological correlates that significantly differentiate those who chose to remain vs leave. The effect sizes in general, however, are typically modest, and relative to the importance of the decision there is clearly a paucity of work, particularly with regards to the psychological correlates of leave vs remain attitudes.

The research to date has largely started from a (stated or implicit) assumption that voters can be clustered simply according to whether they supported leave or remain. Much of the public discourse around Brexit has also adopted this dichotomized, and often polarizing, 'us vs them' framework. However, this approach is almost certainly a gross oversimplification of the structure of the views toward the EU held by proponents on either side of the debate. Indeed, while there are likely many individuals holding consistently anti- or pro-EU sentiment across a range of issues, there are likely others who hold positive attitudes towards some aspects towards the EU, and negative views towards others. For example, immigration was clearly a major issue for many leave voters, but might not have been for all. Thus, rather than assuming the validity of two 'leave vs remain' classes in advance, the current study seeks to offer a data-driven analysis of the latent class structure with regard to attitudes towards the EU.

Understanding the attitudinal clusters that exist towards the EU is of particular importance for at least two reasons. Firstly, and most obviously, it should afford a more accurate insight into how British citizens view the EU. Secondly, and perhaps more interestingly, it would allow researchers to examine how demographic and psychological characteristics differ across the Brexit divide with much greater fidelity. For example, recent work (as noted above) has reported that leave supporters tend to score higher in authoritarianism vs those who wish to remain ([Steenbergen & Siczek, 2017](#)). But one might well expect to see that this link with authoritarianism is evident only for certain types of leave-supporting individuals.

To address this gap in our knowledge we used latent class analysis to assess the number of distinct types of sentiment toward the EU. We used data from the British Election Study (BES). This data provided a number of key advantages. Firstly, the large sample ( $N > 15,000$ ) afforded excellent statistical power. Secondly, this survey was collected close to the referendum date of June 23<sup>rd</sup> 2016 (we used Wave 8 of the BES panel study, which was collected in May and June 2016. We also used a small number of measures from Wave 7, which was collected in April and May 2016). Thirdly, the BES data assessed a fairly representative sample of the eligible voting population of the UK. Fourthly, attitudes towards the EU were widely assessed meaning that comprehensive coverage of this sentiment was available.

We selected attitudes on seven issues that consistently reflect concerns in Britain with regards to the EU – 1) free movement; 2) whether the UK has received a fair-share of EU spending; 3) whether the EU has prevented war; 4) whether the EU has generated more red tape; 5) whether the UK parliament should be able to override EU law; 6) whether the EU has undermined Britain's identity; and 7) EU democracy. We used these items to identify latent classes of attitudes towards the EU. We then examined whether a range of demographic (e.g. age, education)

and psychological characteristics (e.g. Big Five personality, authoritarianism, EU knowledge) differed across these latent classes.

## Method

### Participants

We used data collected as part the British Election Study (BES) Internet Panel. This data is openly available at <http://www.britishelectionstudy.com>. For current purposes we used data primarily from Wave 8 of the BES panel survey, which was chosen because of its proximity to the referendum – the data was collected between May and June 2016. We also used data from Wave 7 (collected between April and May 2016) for ‘actively open-minded thinking’ as it was not available in Wave 8 and for ‘trust in politicians’ as the sample was substantially larger at this wave (i.e. only a subset of the participants were assessed on this measure in Wave 8). In addition, YouGov (who were commissioned to collect this data) routinely collects data about all members of their panel, which meant Big Five personality traits were also available for analysis. We excluded individuals who were not British citizens.

This provided us with 15860 individuals for whom data on our chosen EU items were available (see Measures section below for *Ns* on our demographic and psychological variables). The demographic characteristics of this sample were as follows: mean age = 56.93 ( $SD = 14.24$ ; range 18–96 years); sex: 53% male; ethnicity: 95% white, 0.5% black, 1.5% Asian, mixed race 0.8%, 2.2% ‘other’. The Brexit voting intention (of those intending to vote): 48.5% for remain, 51.5% leave.

### Measures

**EU Sentiment** was assessed with seven items addressing attitudes concerning: free movement, whether the UK has received a fair-share of EU spending, whether the EU has prevented war, whether the EU has generated more red tape; whether the UK parliament should be able to override EU law, whether the EU has undermined Britain’s identity; and EU democracy. These items and response options are detailed in [Table 3](#).

**Education** was assessed with 6 categories, reflecting increasing attainment: no qualifications, GCSE grade D-G (national examinations normally taken at the minimum school leaving age of 16), GCSE grades A-C, A levels (national examinations normally taken at 18 years old), undergraduate degree, and postgraduate degree. Higher scores reflected higher levels of educational attainment. Of those participants who provided complete responses for the EU items 14689 participants also provided complete information on this measure.

**Big Five Personality Traits** (Extraversion, Agreeableness, Conscientiousness, Emotional stability/Neuroticism, and Openness to experiences) were assessed using the Ten Item Personality Measure (TIPI; [Gosling, Rentfrow, & Swann, 2003](#)). Participants were asked: *Here are a number of personality traits which may or may not apply to you. Please indicate the extent to which you agree or disagree with each trait. I see myself as...[adjective]*. The adjectives were as follows: extroverted, quiet (measuring extraversion), dependable, disorganized (measuring conscientiousness) open to new experiences, uncreative (measuring openness to experiences), anxious, calm (measuring neuroticism) and critical, sympathetic (measuring agreeableness). Participants answered on a 5-point scale from 1 (Strongly disagree) to 5 (Strongly agree). A score for each participant for each of the Big Five traits

was constructed as the sum score across the relevant two items. Of those participants who provided complete responses for the EU items 15834 participants also provided complete information for these measures.

**Authoritarianism** was assessed using five items. These items included: “*Young people today don’t have enough respect for traditional British values*”; “*For some crimes, the death penalty is the most appropriate sentence*”; and “*Schools should teach children to obey authority*”. Participants answered on a 5-point scale from 1 (Strongly disagree) to 5 (Strongly agree). A score for each participant was constructed as the mean score across items. Of those participants who provided complete responses for the EU items 14423 participants also provided complete information for this measure.

**Locus of Control: External and Internal** were each assessed using a single item. These items were: “*Many times I feel that I have little influence over the things that happen to me*” (reverse-scored) (locus of control: external); and “*When I make plans, I am almost certain that I can make them work.*” (locus of control: internal). Participants answered on a 5-point scale from 1 (Strongly disagree) to 5 (Strongly agree). Of those participants who provided complete responses for the EU items 13541 and 13509 participants also provided complete information on the locus of control external and internal items, respectively.

**Economic Left Right** was assessed using five items. These items included: “*Government should redistribute income from the better off to those who are less well off*” (reverse-scored); “*Ordinary working people do not get their fair share of the nation’s wealth*” (reverse-scored); and “*Management will always try to get the better of employees if it gets the chance*” (reverse-scored). Participants answered on a 5-point scale from 1 (Strongly disagree) to 5 (Strongly agree). A score for each participant was constructed as the mean score across items. Of those participants who provided complete responses for the EU items 14675 participants also provided complete information on this measure.

**Risk Taking** was assessed using a single item: “*Generally speaking, how willing are you to take risks?*”. Participants answered on a 4-point scale from 1 (Very unwilling to take risks) to 4 (Very willing to take risks). Of those participants who provided complete responses for the EU items 15860 participants also provided complete information on this measure.

**Intolerance of Uncertainty** was assessed using three items. These items were: “*I hate not knowing what the future holds*”; “*I strongly prefer to be certain about the outcome before making a decision*”; and “*I hate uncertainty*”. Participants answered on a 5-point scale from 1 (Strongly disagree) to 5 (Strongly agree). A score for each participant was constructed as the mean score across the items. Of those participants who provided complete responses for the EU items 13374 participants also provided complete information on this measure.

**EU Knowledge** was assessed using six items. Participants were asked whether a statement concerning the EU was true or false. These statements included: “*Each EU Member State elects the same number of representatives to the European Parliament*”; “*Croatia is a member of the EU*”; and “*The European Union is made up of 15 member states*”. A correct answer was scored as 1 and a sum score was generated from responses across the items. Of those participants who provided complete responses for the EU items 15860 participants also provided complete information on this measure.

**Actively Open-Minded Thinking** was assessed using seven items. These items included: “*Allowing oneself to be convinced by an opposing argument is a sign of good character*”; “*Changing your mind is a sign of weakness*”

(reverse-scored); and “*It is important to persevere in your beliefs even when evidence is brought to bear against them*” (reverse-scored). Participants answered on a 5-point scale from 1 (Strongly disagree) to 5 (Strongly agree). A score for each participant was constructed as the mean score across items. Of those participants who provided complete responses for the EU items 3128 participants also provided complete information on this measure. The N for this variable was substantially lower than for the other variables on account of only presented to a sub-set of the BES participants.

**Political Trust** was assessed using a single item: “*How much trust do you have in Members of Parliament in general?*”. Participants answered on a 7-point scale from 1 (No trust) to 7 (A great deal of trust). Of those participants who provided complete responses for the EU items 13633 participants also provided complete information on this measure.

## Analysis

We used the polCA package (Linzer & Lewis, 2011) running in R (R Core Team, 2016) to perform the latent class analysis (LCA). The optimal number of classes was determined by the Bayesian Information Criterion (Schwarz, 1978), with lower values indicating better model fit. Once class membership was estimated for each individual, we proceeded to examine whether these classes differed on our selected social and psychological variables using analysis of variance (ANOVA) (for continuous variables) or the Kruskal-Wallis test (for ordinal or non-normally distributed variables), respectively. An analysis script is provided in the Supplementary Materials.

## Results

Descriptive statistics for our study variables are detailed in Table 1.

The latent class analysis indicated that a 10 class solution was optimal. The BIC was 263941.20 for 10 classes, and 263989.30 and 263949.50 for 9 classes and 11 classes, respectively (see Table 2 for further model fit statistics). We considered alternative models – particularly as the BIC showed a relatively modest change from Classes 8 to 10, and because there was a relatively notable reduction in entropy after Class 8. Models with 8 and 9 class solutions produced similar results to our 10 class solution, but collapsed similar classes from the 10 class solution into one (e.g. an 8 class solution collapsed Classes 1 and 2, and Classes 5 and 6, from the 10 class solution). Ultimately we elected to retain the 10 class solution as our core study goal was to examine the heterogeneity in EU attitude sentiment. As such, to purposefully constrain our model solution to a lower number of classes would serve to mask relevant information: that is, we would rather observe highly similar classes and interpret that fact transparently than miss out on potentially important distinctions. Therefore, 10 classes was judged to provide an appropriate balance between parsimony and fidelity. These 10 classes and the probability of endorsement for each item response are presented in Figure 1 (and detailed in Table 3).

Table 1

*Descriptive Statistics for Study Variables*

Variable	Statistic
<b>Education</b>	<b>N</b>
PG degree	1534
UG degree	5577
A levels	2785
GCSES A-C	2969
GCSE D-G	628
No qualifications	1196
	<b>M (SD)</b>
<b>LOC-external</b>	2.59 (0.97)
<b>LOC-internal</b>	3.70 (0.70)
<b>Political trust</b>	3.00 (1.52)
<b>Uncertainty intolerance</b>	3.46 (0.68)
<b>AOM</b>	3.62 (0.49)
<b>Risk taking</b>	2.50 (0.73)
<b>EU knowledge</b>	2.77 (1.64)
<b>Economic Left Right</b>	2.16 (0.80)
<b>Authoritarianism</b>	3.55 (0.87)
<b>B5-A</b>	6.10 (1.76)
<b>B5-C</b>	6.84 (1.84)
<b>B5-E</b>	4.10 (2.17)
<b>B5-N</b>	3.62 (2.16)
<b>B5-O</b>	5.51 (1.69)

Note. B5 = Big Five personality trait; A = agreeableness; C = conscientiousness; E = extraversion; N = neuroticism; O = openness; LOC = locus of control; AOM = actively open-minded thinking; PG = postgraduate; UG = undergraduate.

Table 2

*Fit Statistics for Latent Class Model Solutions*

Class	BIC	Entropy-squared	G-squared	MLL	DF
2	288497.30	0.90	47982.97	-143934.30	15795
3	276343.90	0.89	35518.99	-137698.00	15762
4	268474.60	0.86	27329.92	-133603.80	15729
5	266105.50	0.82	24643.24	-132259.70	15696
6	265222.60	0.81	23440.68	-131658.70	15663
7	264698.30	0.79	22597.20	-131236.90	15630
8	264286.00	0.79	21866.28	-130871.20	15597
9	263989.30	0.76	21250.69	-130563.30	15564
10	263941.20	0.73	20884.31	-130379.60	15531
11	263949.50	0.72	20574.67	-130224.20	15498

Note. BIC = Bayesian information criterion; MLL = maximum log-likelihood; DF = degrees of freedom.

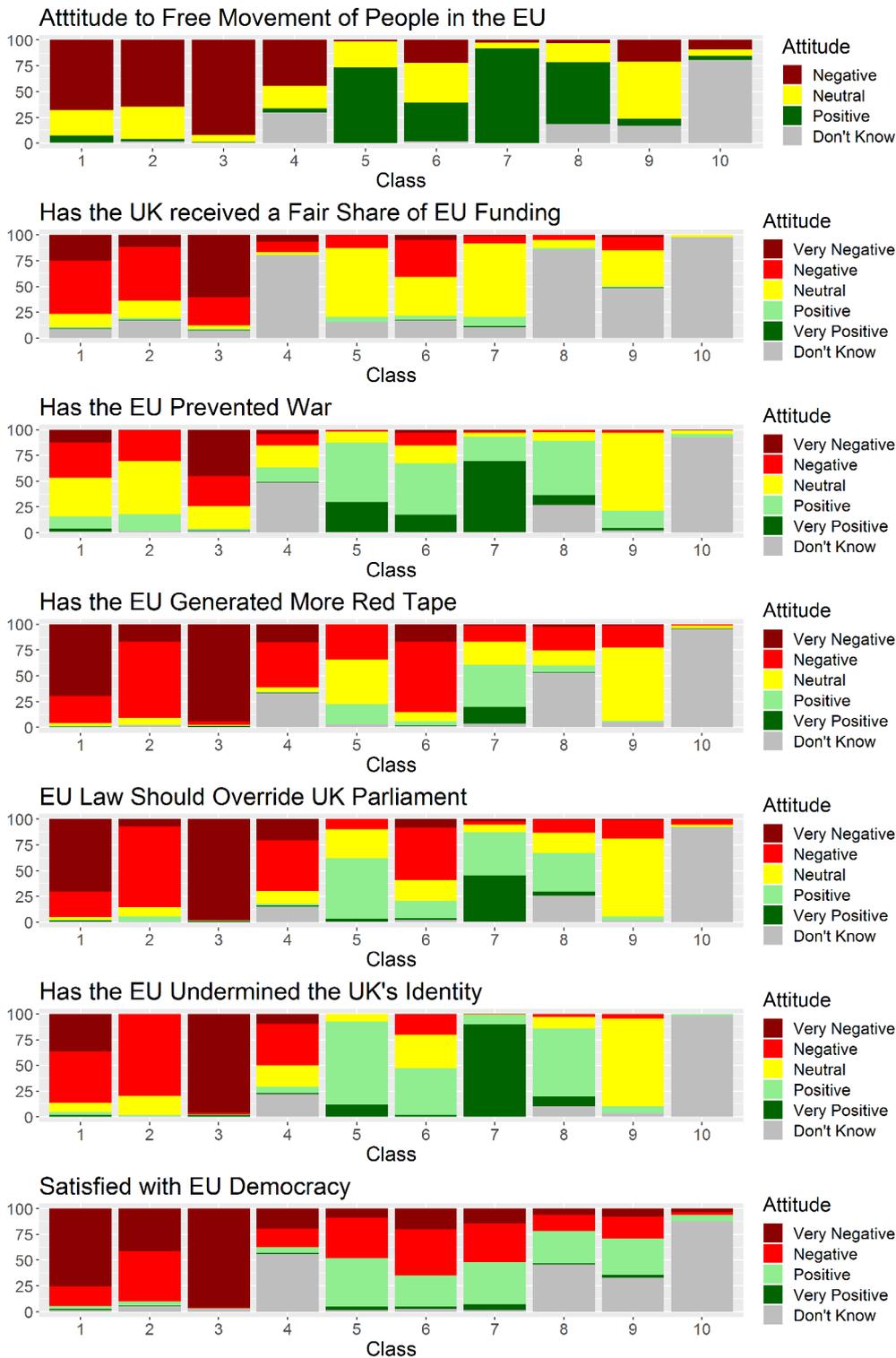


Figure 1. The probability of holding positive or negative attitudes across a range of 7 different issues, for each of the 10 latent classes.

Note. The actual response options differed for each of the questions; see Table 3 for full details.

Table 3

*Latent Class Analysis With 10 Class Solution*

Variable	Class									
	1	2	3	4	5	6	7	8	9	10
<b>Allowing free movement</b>										
1. Good for Britain	.06	.04	.01	.06	<b>.72</b>	<b>.38</b>	<b>.91</b>	<b>.61</b>	.10	.04
2. Neither good nor bad for Britain	.23	.31	.08	.22	.26	<b>.38</b>	.07	.19	<b>.54</b>	.06
3. Bad for Britain	<b>.70</b>	<b>.63</b>	<b>.91</b>	<b>.44</b>	.02	.22	.02	.03	.21	.10
4. Don't know	.01	.02	.01	.28	.00	.02	.00	.16	.15	<b>.81</b>
<b>UK gets fair share of EU spending</b>										
1. Much less	.26	.12	<b>.61</b>	.08	.01	.05	.01	.00	.03	.00
2. A little less	<b>.51</b>	<b>.51</b>	.27	.12	.13	.36	.08	.05	.13	.00
3. About its fair share	.12	.18	.04	.03	<b>.67</b>	<b>.38</b>	<b>.71</b>	.13	.34	.02
4. A little more	.01	.01	.01	.00	.05	.04	.09	.01	.02	.00
5. Much more	.00	.01	.01	.00	.00	.01	.01	.00	.01	.00
6. Don't know	.09	.18	.07	<b>.75</b>	.14	.17	.11	<b>.80</b>	<b>.48</b>	<b>.98</b>
<b>Prevented war in Europe</b>										
1. Strongly disagree	.13	.02	<b>.46</b>	.04	.00	.03	.01	.00	.01	.01
2. Disagree	.35	.29	.28	.12	.02	.12	.02	.03	.03	.00
3. Neither agree nor disagree	<b>.37</b>	<b>.49</b>	.22	.22	.11	.19	.04	.11	<b>.70</b>	.03
4. Agree	.11	.17	.03	.15	<b>.56</b>	<b>.48</b>	.26	<b>.53</b>	.21	.03
5. Strongly agree	.02	.00	.01	.01	.30	.17	<b>.65</b>	.10	.03	.00
6. Don't know	.01	.02	.02	<b>.45</b>	.01	.01	.01	.23	.03	<b>.93</b>
<b>Created more red tape</b>										
1. Strongly disagree	.01	.00	.01	.01	.00	.01	.15	.00	.00	.00
2. Disagree	.01	.01	.00	.01	.20	.04	<b>.40</b>	.08	.01	.00
3. Neither agree nor disagree	.03	.07	.01	.05	<b>.42</b>	.12	.25	.17	<b>.65</b>	.03
4. Agree	.26	<b>.69</b>	.05	<b>.44</b>	.35	<b>.65</b>	.16	.27	.26	.02
5. Strongly agree	<b>.69</b>	.22	<b>.93</b>	.17	.00	.17	.01	.02	.02	.00
6. Don't know	.00	.01	.00	.32	.03	.02	.03	<b>.46</b>	.06	<b>.95</b>
<b>Parliament should be able to override EU laws</b>										
1. Strongly disagree	.01	.00	.01	.02	.03	.02	.41	.04	.01	.00
2. Disagree	.01	.04	.00	.02	<b>.57</b>	.19	<b>.45</b>	<b>.39</b>	.04	.00
3. Neither agree nor disagree	.03	.09	.00	.14	.28	.21	.08	.20	<b>.71</b>	.02
4. Agree	.25	<b>.74</b>	.02	<b>.47</b>	.12	<b>.48</b>	.04	.14	.21	.05
5. Strongly agree	<b>.70</b>	.12	<b>.96</b>	.21	.00	.09	.02	.01	.01	.01
6. Don't know	.00	.01	.00	.15	.01	.02	.00	.22	.02	<b>.91</b>
<b>EU undermines Britain's identity</b>										
1. Strongly disagree	.02	.00	.02	.01	.14	.02	<b>.81</b>	.10	.00	.00
2. Disagree	.03	.03	.01	.07	<b>.77</b>	<b>.46</b>	.17	<b>.64</b>	.11	.01
3. Neither agree nor disagree	.09	.19	.01	.21	.09	.29	.01	.12	<b>.78</b>	.01
4. Agree	<b>.46</b>	<b>.76</b>	.06	<b>.39</b>	.00	.22	.00	.03	.07	.00
5. Strongly agree	.42	.02	<b>.90</b>	.10	.00	.01	.01	.00	.00	.00
6. Don't know	.00	.00	.00	.21	.00	.00	.00	.10	.04	<b>.98</b>

Variable	Class									
	1	2	3	4	5	6	7	8	9	10
<b>EU democracy</b>										
1. Very dissatisfied	<b>.75</b>	<b>.45</b>	<b>.95</b>	.21	.09	.21	.13	.07	.08	.03
2. A little dissatisfied	.19	.44	.02	.20	.39	<b>.44</b>	.39	.18	.23	.03
3. Fairly satisfied	.03	.04	.00	.08	<b>.46</b>	.30	<b>.41</b>	.36	<b>.34</b>	.06
4. Very satisfied	.01	.01	.00	.01	.03	.02	.05	.01	.02	.00
5. Don't know	.02	.07	.02	<b>.50</b>	.02	.03	.02	<b>.39</b>	.32	<b>.88</b>

Note. Bolded values represent the most probable response for the class in question; estimated class population shares for each class: 1) 0.21; 2) 0.11; 3) 0.16; 4) 0.05; 5) 0.15; 6) 0.14; 7) 0.08; 8) 0.04; 9) 0.04; 10) 0.03; for readability the classes have been ordered roughly as 'generally opposed to the EU' (Classes 1-4), 'generally in favour of the EU' (Classes 5-8), and 'neutral/don't know' (Classes 9-10).

**Class 1** included individuals who were moderately-to-strongly opposed to the EU across the majority of the items, although predominantly neutral on whether the EU has prevented war. **Class 2** included individuals who were moderately-to-strongly opposed to the EU across the majority of the items, although they tended to believe that the EU had prevented war. **Class 3** included individuals who were strongly opposed to the EU across all of the items. **Class 4** included individuals moderately opposed to the EU across some of the items, but tended to respond with don't know regarding whether the UK gets its fair share of EU spending, on whether the EU has prevented war, and with regards to their satisfaction on EU democracy. **Class 5** included individuals who were moderately in favour of the EU across the majority of items, but tended to be neutral on whether the EU has created more red tape. **Class 6** included individuals who were moderately in favour of the EU across some of the items, but tended to show dissatisfaction with EU democracy, tended to believe that the EU had created more red tape, and tended to believe that the UK parliament should be able to override EU law. **Class 7** included individuals who were moderately-to-strongly in favour of the EU across all of the items, except on whether the UK received a fair share of EU spending where they were predominantly neutral. **Class 8** included individuals who were moderately in favour of the EU, but tended to respond with don't know regarding whether the UK gets its fair share of EU spending, whether the EU had created more red tape, and with regard to their satisfaction on EU democracy. **Class 9** included individuals who were somewhat in favour of the EU, but who tended to sit on the fence for most items – e.g. whether the EU has prevented war, whether the EU has created more red tape, whether UK parliament should be able to override EU law, and whether the EU has undermined British identity. They also tended to respond with don't know on whether the UK gets its fair share of UK spending. **Class 10** included individuals who tended to respond with don't know across all items.

Having identified these 10 classes, we next examined whether they differed across our demographic and psychological variables. As detailed in Table 3, all of the variables differed significantly across the different classes. These models were thus further probed with post-hoc pairwise comparisons (corrected for multiple tests). These results are extensive (i.e. 720 pairwise comparisons) and so are presented here in summary (see Tables A.1 and A.2 in the Appendix for the full results). Here we refer to the Classes 1 to 4 as 'leavers', and Classes 5 to 9 as 'remainers' on account of the majority of individuals in these classes expressing leave and remain sentiment, respectively (i.e. see Figure 2). Class 10 showed a higher proportion of remainers (vs leavers); but was more notable for the large proportion of 'don't know' responses.

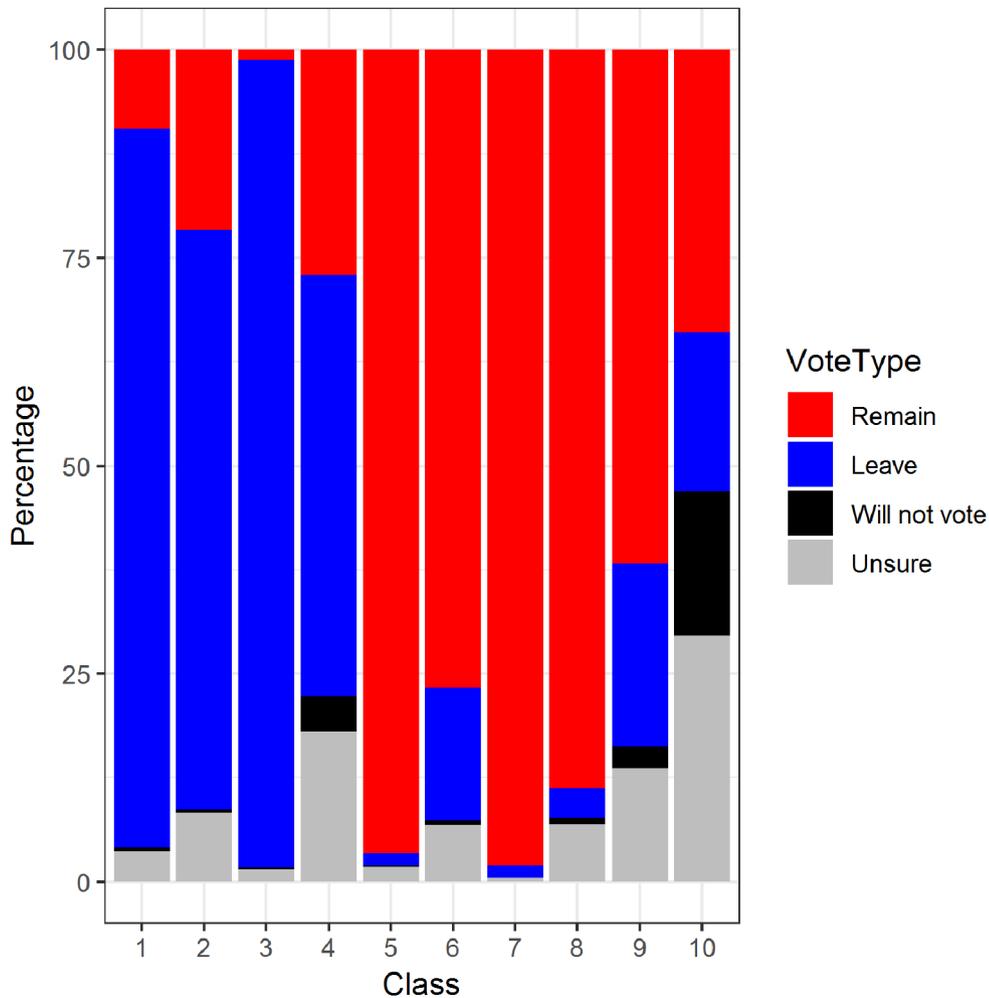


Figure 2. Brexit voting intention across the 10 latent classes.

In general we observed that the classes with more individuals who wanted to leave tended to be older (Table 4) and scored higher on the measures of authoritarianism (Figure 3) and conscientiousness (Figure 4). Classes with individuals who mostly wanted to remain tended to be more highly educated and scored more highly on the measures of actively open-minded thinking, openness, political trust, and external locus of control (see Table 4 and Figures 3 and 4).

Table 4  
 Mean Score (Standard Deviation) for Dependent Variables (by Class), Percentage Remain/Leave Intended Vote for Each Class, and the Results of the ANOVAs and Kruskal-Wallis Tests

Variable	Class										ANOVA													
	1	2	3	4	5	6	7	8	9	10	M	SD	F	df	p	ω								
1. Age	60.65	12.16	59.55	12.77	61.37	11.74	53.37	14.78	55.65	14.66	56.07	14.51	51.83	14.79	48.33	15.84	52.21	14.44	43.08	14.57	184.60	9, 15850	< 2×10 <sup>-16</sup>	.31
2. EU knowledge	2.98	1.49	2.57	1.50	3.04	1.49	1.23	1.24	3.19	1.53	2.91	1.52	3.77	1.54	1.68	1.39	1.76	1.57	0.34	0.75	414.80	9, 15850	< 2×10 <sup>-16</sup>	.44
3. Uncertainty	3.46	0.67	3.50	0.62	3.43	0.73	3.66	0.64	3.39	0.67	3.51	0.67	3.32	0.82	3.55	0.70	3.44	0.55	3.67	0.65	18.15	9, 13364	< 2×10 <sup>-16</sup>	.11
4. AOM	3.56	0.41	3.50	0.44	3.44	0.50	3.44	0.47	3.79	0.42	3.63	0.47	4.11	0.48	3.73	0.43	3.36	0.44	3.23	0.35	65.56	9, 3118	< 2×10 <sup>-16</sup>	.40
5. Authoritarianism	3.93	0.65	3.73	0.61	4.16	0.61	3.88	0.63	2.88	0.76	3.49	0.72	2.33	0.80	3.14	0.79	3.49	0.65	3.75	0.70	1020.00	9, 14413	< 2×10 <sup>-16</sup>	.62
6. B5-A	6.12	1.76	6.16	1.70	6.06	1.90	6.31	1.79	6.11	1.69	6.10	1.73	6.01	1.75	6.12	1.78	6.03	1.61	5.86	1.63	3.08	9, 15824	.001	.03
7. B5-C	7.03	1.78	6.85	1.73	7.14	1.86	6.76	1.71	6.74	1.79	6.84	1.85	6.46	2.12	6.65	1.92	6.45	1.70	6.32	1.79	25.93	9, 15824	< 2×10 <sup>-16</sup>	.12
8. B5-E	4.05	2.15	4.03	2.05	4.11	2.27	4.00	1.97	4.17	2.25	4.15	2.15	4.19	2.37	3.83	2.16	4.21	1.93	4.29	1.82	2.78	9, 15824	.003	.03
9. B5-N	3.49	2.16	3.66	2.07	3.48	2.27	3.97	2.18	3.52	2.09	3.57	2.13	3.67	2.23	4.01	2.24	3.99	1.95	4.36	1.90	16.33	9, 15824	< 2×10 <sup>-16</sup>	.09
10. B5-O	5.35	1.69	5.27	1.58	5.43	1.75	5.25	1.56	5.80	1.65	5.44	1.69	6.27	1.83	5.70	1.73	5.29	1.50	5.41	1.39	47.81	9, 15824	< 2×10 <sup>-16</sup>	.16

Variable	Kruskal-Wallis Test	
	H	p
11. LOC external	2.51	0.96
12. LOC internal	3.74	0.68
13. Risk taking	2.56	0.72
14. Education	2.25	0.82
15. Econ conservatism	2.90	1.52
16. Political trust	2.90	1.52

Note. LOC = locus of control; AOM = actively open-minded; B5 = Big Five; A = agreeableness; C = conscientiousness; E = extraversion; N = neuroticism; O = openness; the effect size is not readily available or interpretable for the Kruskal-Wallis omnibus test and so these are not detailed above. The p values were so small for a number of the omnibus tests that the precise number was not readily available and so they are presented here as generated by the 'summary' function in R.

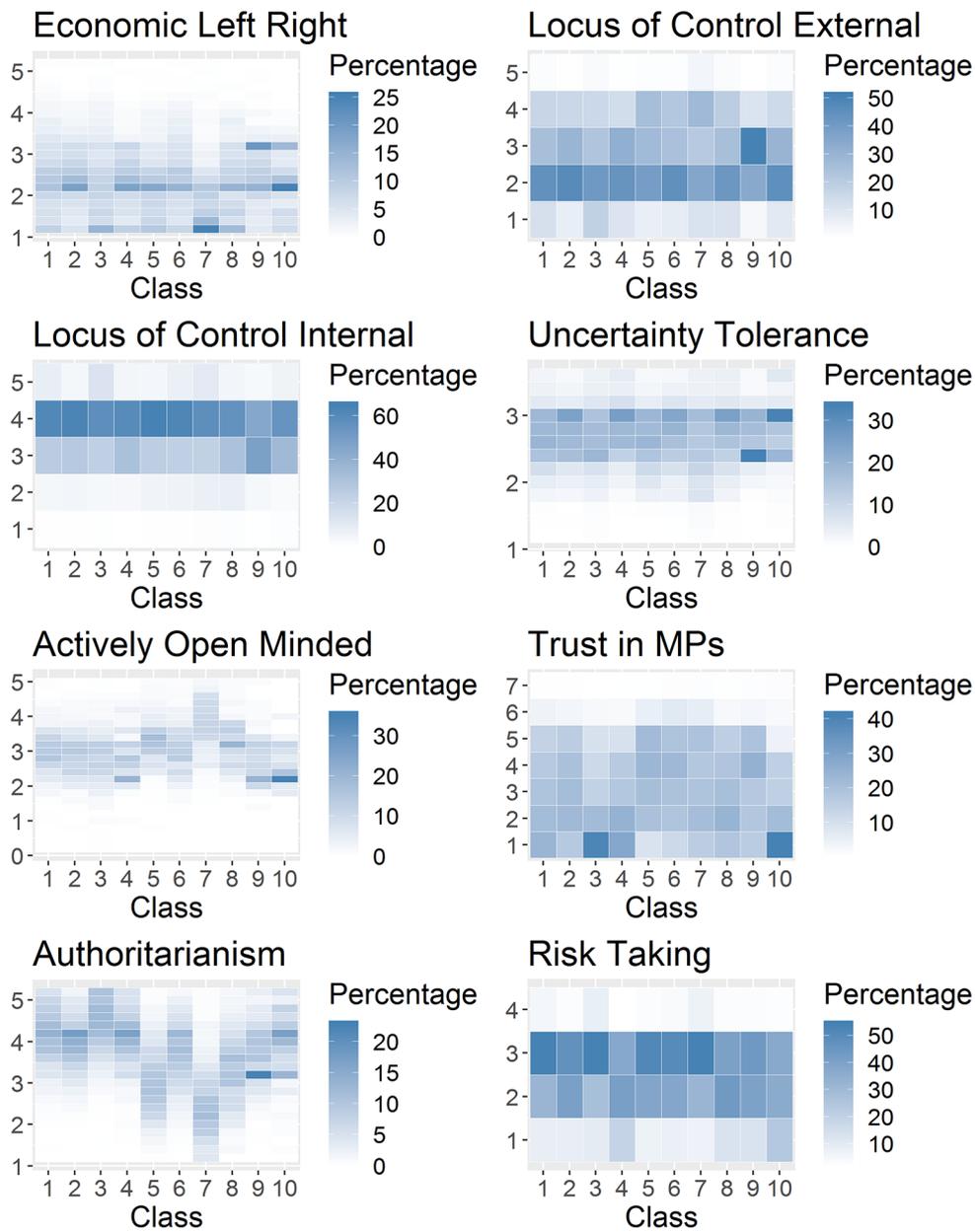


Figure 3. The percentage of responses at different levels across the different psychological variables and political attitudes, for the 10 latent classes. See Table 4 for mean values by class.

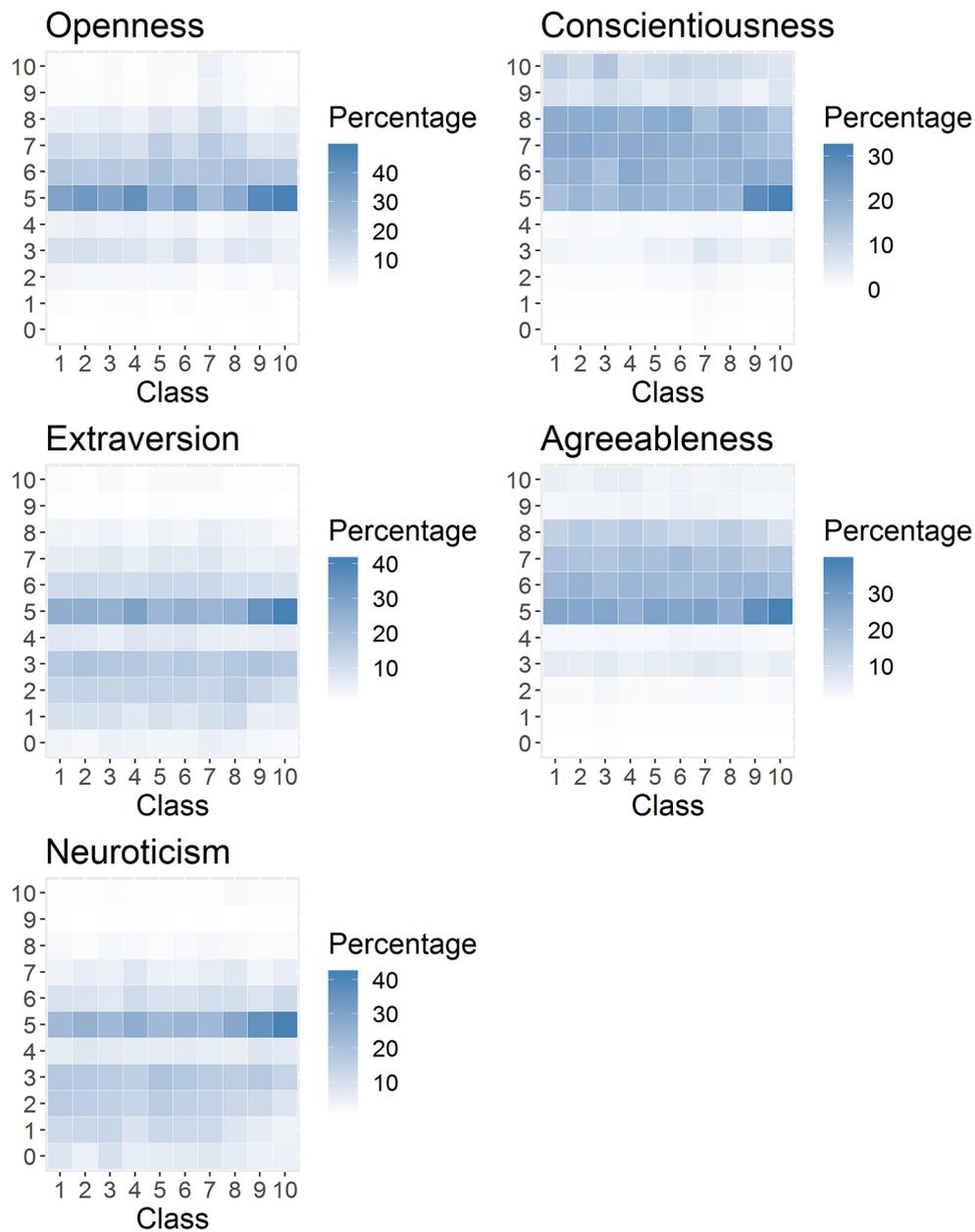


Figure 4. The percentage of responses at different levels for each of the Big 5 personality traits. See Table 4 for mean values by class.

There are also several striking differences *within* the classes more associated both with leave and remain. The most notable differences with the remain classes are reflected in the variables authoritarianism, openness, actively open-minded thinking, and EU knowledge. Here, individuals in Class 7 stand out as being substantially more knowledgeable about the EU, higher on actively open-minded thinking, higher on openness, and lower on authoritarianism, than the other remain classes. In fact, these differences – all highly significant (all  $p < .001$ : see the Appendix for full details) – reflect approximately a standard deviation shift in each case.

The most notable differences with the leave classes are reflected in EU knowledge and authoritarianism as well, but also with political trust. Here, individuals in Class 3 were noted to be significantly higher on authoritarianism

and lower on political trust, whereas Class 4 was notably lower on EU knowledge, than the other leave classes (all  $p < .001$ : see [Appendix](#) for full details).

Finally, we looked at the voting behaviour of participants from the 10 latent classes from the most recent general election (which was held in 2015). These results are presented in [Figure 5](#). There are a number of salient differences across classes, such as the higher proportion of UK Independence Party (UKIP) voters in Class 3, and the higher proportion of Green Party voters in Classes 7 and 8. However, it's also notable that each of the classes comprise voters who have supported the spectrum of different political parties in the UK.

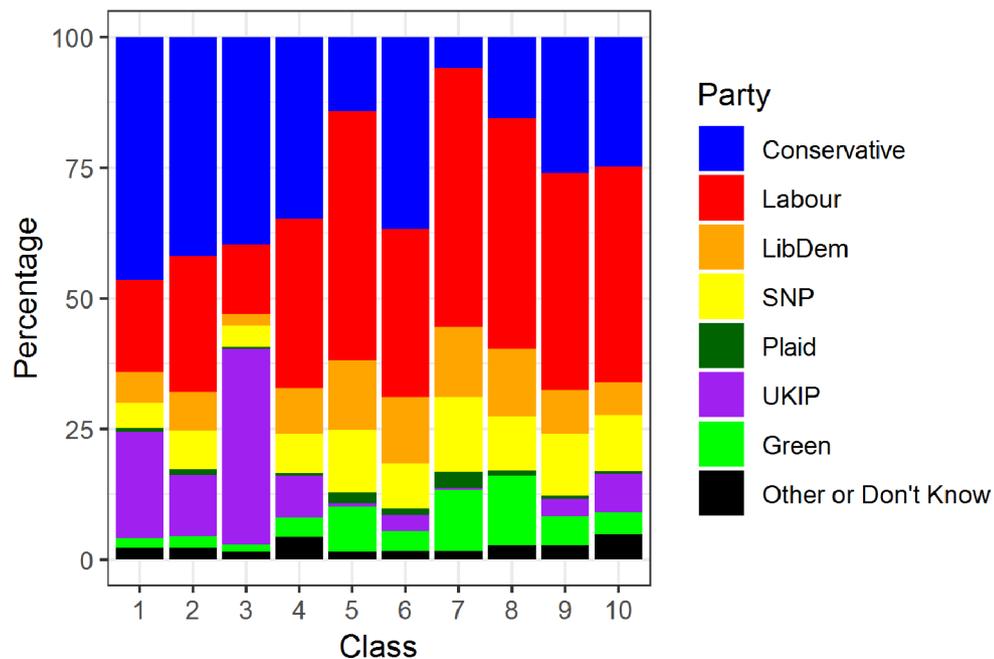


Figure 5. The 2015 voting behaviour of the 10 latent classes.

## Discussion

The current study examined attitudes towards the European Union (EU) in a large sample of British citizens just prior to the 2016 referendum on EU membership. The first most striking result of this analysis is that voters do not fall simply into two (leave vs remain) classes. Our results revealed 10 latent classes, based on their different patterns of attitudes towards the EU. Four of these groups contained notably more leave voters, whilst 5 of these groups contained notably more remain voters (the tenth class contained more remainers than leavers, but this difference was far less pronounced than for the other 9 classes). This finding indicates that the 'remain' side of the argument is clustered into more distinct groupings. In general, then, this finding clearly resonates with political commentary arguing that there are different 'types' of leave and remain voter and provides a strong demonstration of this claim in a data driven fashion.

We also observed some clear distinctions between the various classes across a range of demographic and psychological variables. In general, the classes that included majority-remain supporters were younger and better

educated, and self-rated more highly on the measures of actively open-minded thinking, openness, political trust, and external locus of control. The classes that included majority-leave supporters were older and less well educated, and self-rated more highly on the measures of authoritarianism and conscientiousness.

Of importance, though, was the observation that even within classes with majority-remain or -leave supporters there were striking differences across several of the demographic and psychological variables, and these sometimes were as large as the differences between the classes of majority-leave vs -remain supporters. For example, while no class with majority-remain supporters scored as highly in authoritarianism as the classes with majority-leave supporters, we noted substantial variation – i.e. standard deviation shifts – in levels of authoritarianism within the classes associated with remain. And while no class with majority-leave supporters scored as highly in political trust as the classes with majority-remain supporters, we noted substantial variation – again, approximately standard deviation shifts – in levels of political trust within the classes associated with leave.

Overall, then, the current results strongly indicate that the leave vs remain distinction misses important cleavages, and that these ‘hidden cleavages’ in turn can be differentiated on a range of important demographic and psychological variables. In short, the Brexit debate – certainly with regards to how the general public feels about the EU – is vastly more complex than commonly framed in public discussion; both with regards to the attitudes held by those in the so-called leave and remain camps, but also with regard to their broader demographic and psychological characteristics.

More generally, these results are consistent with a large body of literature highlighting that socio-political attitudes and choices are associated with a wide range of individual differences on a range of levels from cognitive flexibility (Amodio, Jost, Master, & Yee, 2007; Jost, Glaser, Kruglanski, & Sulloway, 2003; Van Hiel, Onraet, & De Pauw, 2010), personality (Gerber, Huber, Doherty, Dowling, & Ha, 2010; Lewis, 2018; Sibley, Osborne, & Duckitt, 2012), and moral values (Graham, Haidt, & Nosek, 2009; Lewis & Bates, 2011). For example, the observation that the classes of leavers tend to be less open and more conscientious dovetails neatly with meta-analytic work reporting the same pattern of associations for political conservatism (Sibley et al., 2012).

A number of limitations require mentioning. Firstly, the data from the British Election Study data allowed us to examine a range of demographic and psychological factors for links to EU sentiment. There are, however, clearly other factors – including moral values (Graham et al., 2009) and general intelligence (Deary, Batty, & Gale, 2008; Lewis & Bates, 2018; Schoon, Cheng, Gale, Batty, & Deary, 2010) – which are of likely relevance, but that were not available in the current study. Future work, then, should seek to expand the scope of the current study to address broader predictors of socio-political sentiment.

Secondly, for a number of our measures we necessarily relied on short-form measures, which are not always ideal with regards to their psychometric properties. For example, the Big Five personality traits were measured with a two-item per domain instrument. While this approach is recommended for this kind of large scale data collection (Gosling et al., 2003), it is nonetheless the case that a measure of greater fidelity would have allowed more fine-grained analyses of the personality differences across the classes.

Thirdly, only a sub-set of EU issues were addressed in our latent class analysis and so it is conceivable that further nuances in attitude clustering might exist, were more items included. That said, the most commonly noted issues in the referendum were included here, so any further classes that might exist are likely to be relatively inconsequential for the broader debate.

Fourthly, model selection with latent class analysis involves a necessary degree of subjectivity. Our favoured 10 class solution has the benefit of providing a fairly fine-grained assessment of the EU attitude profiles. However, this comes at the cost of generating classes with similar profiles.

Finally, based on these results we cannot make any claims as to how stable the observed classes are over time or across different social or political issues. It is possible that some of the classes with the most extreme scores on certain measures (particularly Classes 3, 7 and 10) will reflect clusterings of voters who might well coalesce on other political issues, but this is a matter for further research.

In summary, we used latent class analysis on a large sample ( $N > 15,000$ ) of adult British citizens who completed a survey addressing their sentiment toward the EU (among other issues). We observed 10 latent classes, with several reflecting individuals who tended to support leave, and several containing individuals who tended to support remain. These findings highlight that characterising the Brexit debate along simple leave vs remain lines fails to recognise important attitudinal variability that exists within these broad camps. This is further emphasised by our observations of demographic and psychological differences both across and within classes of leave and remain supporters. A full consideration of these attitudinal nuances will be necessary to achieve a deeper understanding of why the UK decided to leave the EU.

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## Competing Interests

The authors have declared that no competing interests exist.

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## Data Availability

The R code necessary to run the analyses reported in this study, is freely available (see the [Supplementary Materials](#) section).

## Supplementary Materials

The R code necessary to run the analyses reported in this study, is freely available (for access see Index of [Supplementary Materials](#) below).

### Index of Supplementary Materials

Lewis, G. J., & de-Wit, L. (2019). *Supplementary materials to "How many ways to say goodbye? The latent class structure and psychological correlates of European Union sentiment in a large sample of UK adults"*. PsychOpen.  
<https://doi.org/10.23668/psycharchives.2447>

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## Appendix

Table A1

*Post-Hoc t-Test p Values for Continuous Variables*

Class comparison	Age	EU know	Uncertainty	AOM	Auth	A	C	E	N	O
2-1	.16	<.001	.90	.61	<.001	1.00	.04	1.00	.18	.87
3-1	.57	.85	.83	<.001	<.001	.97	.37	.99	1.00	.72
4-1	<.001	<.001	<.001	.24	.92	.17	.010	1.00	<.001	.87
5-1	<.001	<.001	.01	<.001	<.001	1.00	<.001	.62	1.00	<.001
6-1	<.001	.85	.44	.38	<.001	1.00	.01	.86	.97	.55
7-1	<.001	<.001	<.001	<.001	<.001	.75	<.001	.68	.25	<.001
8-1	<.001	<.001	.28	.02	<.001	1.00	<.001	.40	<.001	<.001
9-1	<.001	<.001	.99	.002	<.001	.98	<.001	.85	<.001	1.00
10-1	<.001	<.001	<.001	<.001	.01	.08	<.001	.41	<.001	1.00
3-2	<.001	<.001	.14	.60	<.001	.72	<.001	.96	.16	.07
4-2	<.001	<.001	<.001	.97	<.001	.64	.98	1.00	.02	1.00
5-2	<.001	<.001	<.001	<.001	<.001	1.00	.60	.56	.58	<.001
6-2	<.001	<.001	.99	.005	<.001	1.00	1.00	.78	.94	.04
7-2	<.001	<.001	<.001	<.001	<.001	.43	<.001	.59	1.00	<.001
8-2	<.001	<.001	.91	<.001	<.001	1.00	.36	.68	.02	<.001
9-2	<.001	<.001	.89	.16	<.001	.88	<.001	.77	.04	1.00
10-2	<.001	<.001	.02	.02	1.00	.03	<.001	.34	<.001	.82
4-3	<.001	<.001	<.001	1.00	<.001	.02	<.001	.97	<.001	.18
5-3	<.001	.01	.67	<.001	<.001	.99	<.001	1.00	1.00	<.001
6-3	<.001	.09	.01	<.001	<.001	1.00	<.001	1.00	.94	1.00
7-3	<.001	<.001	<.001	<.001	<.001	1.00	<.001	.99	.22	<.001
8-3	<.001	<.001	.03	<.001	<.001	1.00	<.001	.12	<.001	.01
9-3	<.001	<.001	.99	.84	<.001	1.00	<.001	.99	<.001	.75
10-3	<.001	<.001	<.001	.14	<.001	.39	<.001	.81	<.001	1.00
5-4	.001	<.001	<.001	<.001	<.001	.17	1.00	.71	<.001	<.001
6-4	<.001	<.001	<.001	.005	<.001	.15	.99	.84	<.001	.12
7-4	.28	<.001	<.001	<.001	<.001	.01	.01	.68	.07	<.001
8-4	<.001	<.001	.18	<.001	<.001	.64	.98	.91	1.00	<.001
9-4	.87	<.001	<.001	.96	<.001	.11	.07	.78	1.00	1.00
10-4	<.001	<.001	1.00	.27	.29	<.001	.001	.38	.05	.77
6-5	.99	<.001	<.001	<.001	<.001	1.00	.62	1.00	1.00	<.001
7-5	<.001	<.001	.11	<.001	<.001	.83	<.001	1.00	.62	<.001
8-5	<.001	<.001	<.001	.97	<.001	1.00	.99	.03	<.001	.96
9-5	<.001	<.001	.94	<.001	<.001	.99	.03	1.00	<.001	<.001
10-5	<.001	<.001	<.001	<.001	<.001	.11	<.001	.98	<.001	<.001
7-6	<.001	<.001	<.001	<.001	<.001	.91	<.001	1.00	.93	<.001
8-6	<.001	<.001	.98	.57	<.001	1.00	.38	.05	<.001	.04
9-6	<.001	<.001	.65	<.001	1.00	1.00	<.001	1.00	.001	.64
10-6	<.001	<.001	.04	<.001	<.001	.16	<.001	.95	<.001	1.00
8-7	<.001	<.001	<.001	<.001	<.001	.96	.59	.03	.06	<.001
9-7	<.001	<.001	.05	<.001	<.001	1.00	1.00	1.00	.10	<.001
10-7	.99	<.001	<.001	<.001	<.001	.86	.91	1.00	<.001	<.001
9-8	<.001	.99	.33	<.001	<.001	1.00	.73	.09	1.00	.001
10-8	<.001	<.001	.53	<.001	<.001	.31	.10	.02	.18	.14
10-9	<.001	<.001	.002	.87	<.001	.88	.98	1.00	.15	.97

*Note.* *p* values are adjusted for multiple comparisons using Tukey's HSD approach. EU know = EU knowledge; AOM = actively open-minded; Auth = authoritarianism; A = agreeableness; C = conscientiousness; E = extraversion; N = neuroticism; O = openness.

Table A2

Post-hoc *t*-Test *p* Values for Ordinal and Non-Parametric Variables

Class comparison	Edu	Econ	LOCext	LOCint	Risk	Pol trust
2-1	1.00	1.00	1.00	.01	<.001	.01
3-1	<.001	<.001	.05	.01	.61	<.001
4-1	1.00	1.00	1.00	.09	<.001	<.001
5-1	<.001	<.001	<.001	.24	.009	<.001
6-1	<.001	1.00	<.001	1.00	<.001	<.001
7-1	<.001	<.001	<.001	1.00	.02	<.001
8-1	<.001	.006	1.00	<.001	<.001	1.00
9-1	.47	.006	<.001	<.001	<.001	<.001
10-1	1.00	1.00	1.00	.23	<.001	<.001
3-2	<.001	<.001	<.001	<.001	<.001	<.001
4-2	.62	.22	1.00	1.00	<.001	<.001
5-2	<.001	<.001	<.001	1.00	.65	<.001
6-2	<.001	1.00	1.00	.76	.89	<.001
7-2	<.001	<.001	<.001	1.00	<.001	.51
8-2	<.001	<.001	1.00	.51	.07	1.00
9-2	1.00	.22	.01	<.001	1.00	.97
10-2	1.00	1.00	1.00	1.00	<.001	<.001
4-3	1.00	1.00	.71	<.001	<.001	.003
5-3	<.001	.42	<.001	<.001	<.001	<.001
6-3	<.001	<.001	<.001	<.001	<.001	<.001
7-3	<.001	<.001	<.001	.02	1.00	<.001
8-3	<.001	1.00	.03	<.001	<.001	<.001
9-3	<.001	<.001	<.001	<.001	<.001	<.001
10-3	1.00	1.00	1.00	<.001	<.001	1.00
5-4	<.001	.05	<.001	1.00	<.001	<.001
6-4	<.001	.32	.24	1.00	<.001	<.001
7-4	<.001	<.001	<.001	1.00	<.001	<.001
8-4	<.001	1.00	1.00	1.00	.55	.001
9-4	.03	<.001	.002	<.001	.02	<.001
10-4	1.00	1.00	1.00	1.00	1.00	.04
6-5	<.001	<.001	.01	1.00	1.00	1.00
7-5	<.001	<.001	1.00	1.00	<.001	.001
8-5	<.001	1.00	.02	.04	<.001	<.001
9-5	<.001	<.001	1.00	<.001	.01	.34
10-5	<.001	1.00	.12	1.00	<.001	<.001
7-6	<.001	<.001	.16	1.00	<.001	.07
8-6	.90	<.001	1.00	.001	<.001	<.001
9-6	<.001	.11	1.00	<.001	.02	1.00
10-6	<.001	1.00	1.00	1.00	<.001	<.001
8-7	<.001	<.001	.06	.004	<.001	.20
9-7	<.001	<.001	1.00	<.001	<.001	1.00
10-7	<.001	<.001	.21	1.00	<.001	<.001
9-8	<.001	<.001	.24	.08	1.00	.30
10-8	<.001	1.00	1.00	1.00	.40	<.001
10-9	.62	.06	.43	.03	.02	<.001

Note. *p* values are adjusted for multiple comparisons using the Bonferroni correction. Edu = education; Econ = economic conservatism; LOCext = external locus of control; LOCint = internal locus of control; Risk = risk taking; Pol trust = trust in politicians.