Determinants of voter turnout

Diogo Ribeiro[1]*, Mara Madaleno[1], Anabela Botelho[1]

Abstract
In this study, we analyze how sociodemographic characteristics, level of political identification, level of ideological identification, risk aversion, and cognitive biases affect the probability of voting. For that effect, we use a database of about 103 individuals and apply factor analysis to estimate the dimensions that capture cognitive biases, risk aversion, the level of political identification, and the level of ideological identification. Subsequently, through the estimation of a logit model, we examine how each variable affects the probability of voting based on their average marginal effects. We find that risk aversion, and cognitive biases, namely overconfidence and winning effect, significantly influence the likelihood of voting. We also find that ideological identification negatively influences the likelihood of voting.

[1] *Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP), Department of Economics, Management, Industrial Engineering and Tourism (DEGEIT), University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal.*
Corresponding author: diogobarros@ua.pt

Introduction

Political economists have noted that bringing the same cognitive biases that affect market outcomes to political economy analyses may suggest new study processes that improve our understanding of political behavior (Schnellenbach & Schubert, 2015). This article seeks to contribute to this line of research by linking cognitive biases and political behaviors (Mousavi & Kheirandish, 2017; Pennycook & Rand, 2019). Although it might be simple to theorize about the various cognitive biases, as well as other factors affecting voters during the time of voting (Crowder-Meyer et al., 2020), few empirical studies have focused on this research line. To do so requires that, in addition to the political behavior, we take into account the ideas and the personal, economic, and social interests of individuals. The identification with a political ideology by individuals (Soon, 2017) is a concrete example of reviewing personal ideas in the form of a societal organization (Tappin et al., 2020). However, identification with a political ideology may not be reflected in the affiliation or choice of a political party (Ksiazkiewicz, 2021; Theodoridis, 2017). Therefore, both should be considered in the understanding of political behavior (Goggin et al., 2020).

Moreover, political behavior is also sensitive to cognitive biases (Pennington & Winfrey, 2021). Cognitive biases such as overconfidence, anchoring effect, and winning and losing effects (Baddeley, 2017) may be responsible for incoherent choices and may lead individuals to have misplaced opinions of their rational knowledge and behaviors (Anderson et al., 2022). Thus, this work relates cognitive biases, the level of political and ideological identification, risk preferences, and sociodemographic factors with the probability of voting in the elections.

Using an original database with responses from 103 individuals collected through an online questionnaire, and based on a factor analysis, it was possible to quantify the level of ideological identification, level of political identification, degree of risk aversion and overconfidence, sensitivity to the anchoring effect (Beblo et al., 2017) and to the winning and losing effects (e.g., De Palma et al., 2014). Subsequently, and using a logit model, we related all these factors, plus a set of sociodemographic variables, with a dichotomic dependent variable taking the value of 1 for the individuals who voted in the last elections and 0 for the individuals who did not vote. We conclude that sociodemographic factors such as age, education, income, psychological bias as risk aversion, and cognitive biases (overconfidence, and the winning effect), as well as the level of ideological identification, affect the probability of voting.

The article is organized as follows. Second section presents the theoretical framework, providing political terminology and hypotheses' formulation. Third section presents the data and methodology. Empirical results are presented and discussed in fourth section, and fifth section concludes.

Theoretical framework

Understanding the decision to vote involves realizing how a set of factors may interfere with the behavior and attitude of voters. These factors may be related to the profile of individuals, but they may also be linked to individuals' view of democracy, given that today a large part of the popula-

tion places their trust in democracy as a form of governance (Dahlberg et al., 2015). Thus, the decision to vote can be conditioned by political ideology (they consist of a set of principles and ideas on how society should be structured in the social, cultural, and economic fields, functioning as a guide to how power should be distributed and used), the performance of the previous government, personal interests and characteristics of the individual, disillusionment with the decisions of previous political parties, sociodemographic factors, among others.

The ideological view is not always clear, since the liberal-conservative dichotomy can mask many ideological differences. For example, one may have liberal views on social issues, but have more conservative views on economic issues (Inbar & Lammers, 2012) which may be controversial. In general, individuals review their ideologies in political parties, and may or may not adhere to them. Notwithstanding, belonging to a political party can help individuals identify with a political ideology (Ward & Tavits, 2019).

Whether or not one is affiliated with a party may have repercussions on different political behaviors since the way sympathizers defend a party differs from a true supporter by placing less emphasis and presenting a less partisan social identity (Greene, 2000). In addition, individuals associated with certain parties may not express their political opinions (Inbar & Lammers, 2012) by adopting the party's ideas. This conforms to the view that individuals belonging to a party may have their vision focused on group behavior, ignoring other factors. Therefore, partisanship can affect voters' orientation towards the political system (Ward & Tavits, 2019).

These differences may be justified by the characteristics of individuals, by factors that affect personality, among others. Gerber et al. (2012) analyzed the associations between personality traits (big five) and the strength and direction of party identification, suggesting that the associations between these two facts are largely mediated by ideology. They stressed that personality traits affect substantially whether individuals join any party, as well as the strength of those affiliations. Thus, the effects of personality operate on virtually every aspect of political behavior (Mondak & Halperin, 2014), which may explain the voting intentions of individuals. Despite these findings, the effect of personality traits has received little attention in recent decades in political studies. Personality neglect has been understandable for many years since psychological research on personality has not produced concise taxonomies applicable to the study of politics (Mondak & Halperin, 2014).

Another relevant aspect concerns decision making that lacks a set of knowledge that is not always easily managed by individuals. The information needed to make a responsible and conscious vote requires the collection of information, the assessment of interests, knowledge, and ideology. Thus, the complexity of the decision to vote may be related to sociodemographic factors (Coffé & Bolzendahl, 2010), cognitive biases, party identification (which is a predictor of voting for a party as well as voting in elections; Garry, 2007), and ide-ological identification. To assess the ideology, we can resort to self-report questions because the self-assessed ideology is highly predictive of attitudes on specific issues, allowing the direct classification of respondents – as liberal, moderate or conservative –, facilitating and allowing international comparisons (Inbar & Lammers, 2012; Jost, 2006)). We can also resort to a set of non-political issues, as well as political issues to identify ideology (Norrander & Wilcox, 2008). All this allows us to formulate a set of hypotheses.

> Hypothesis 1. *Age* – Older individuals are more likely to vote in elections.

Older individuals tend to be more experienced and interested in political issues which, in turn, leads to increased electoral participation among the elderly (Goerres, 2007). In addition, growing older is accompanied by a greater reaction to social pressure, which may lead to a greater propensity to vote compared to younger voters (Panagopoulos & Abrajano, 2014). Thus, we expect the political behavior of young people to be different from their older counterparts (Smets, 2021), with the latter being more interested in political issues.

> Hypothesis 2. *Education (Educ)* – Higher education levels increase the probability of voting.

Authors such as Ahlskog (2021) noted that while education may not affect national electoral participation, it may affect participation in European elections. Education is thought to be a fundamental focus variable because through its increase we observe an expansion of civic awareness, knowledge of the role of government in a democracy, etc. Thus, we expect higher education levels to positively impact the likelihood of voting (Hansen & Tyner, 2021) since the increase in education increases awareness of the civic duties of voting (Hansen & Tyner, 2021; Panagopoulos & Abrajano, 2014). In addition, civic duty is one of the predictors of voter turnout (Feitosa et al., 2020).

> Hypothesis 3. *Gender* – There are no differences between men and women in electoral participation.

We expect no gender differences in electoral participation after controlling for variables such as age, income, education, party identification, risk aversion, cognitive biases and political ideology, since controlling for these characteristics allows one to better filter the impact of gender on the decision to vote (Coffé & Bolzendahl, 2010; Norris, 1991). Although there is some evidence suggesting that women tend to have a higher electoral participation than men (Carreras, 2018; Coffé & Bolzendahl, 2010), we note that men and women enjoy equal rights concerning their participation in elections in democratic states. In addition, there is also some evidence that over the years, gender inequalities in voter participation have been decreasing (Gallego, 2007).

Hypothesis 4. *Ideological identification (II)* – Individuals who identify themselves with a strong ideological vision are less likely to vote.

Having an ideological identification comprises having principles and ideas of governance of society, but may not be reflected in belonging to a party. Thus, individuals who have a strong ideological identification may present their views on how society should be governed by differing from the way political parties present their proposals and want to govern society, which can translate into differences between members and non-members of political parties (Ji & Jiang, 2020).

Moreover, the ideological view of party members may not fully corroborate the party's ideas (Kölln & Polk, 2017) by presenting ideological incongruity towards political parties. Thus, maintaining a strong ideological vision can affect individuals by creating disagreements in the face of party ideologies and political representatives, and ideological incongruity may affect the satisfaction of individuals with democratic performance (Best & Seyis, 2021). Having a strong ideological identification may, therefore, reduce the likelihood of voting.

Hypothesis 5. *Party identification (PI)* – Individuals who identify with a party are more likely to vote.

Party identification is expected to increase the probability of voting because individuals who identify with political parties derive greater satisfaction from political systems (Barbet, 2020) , making them receptive to political and electoral issues (Huddy et al., 2015). Additionally, being identified with a party can help identify with a political ideology (Ward & Tavits, 2019). Thus, political identification influences, for example, the intensity of how individuals experience elections (Huddy et al., 2015) and political choices and participation (Garry, 2007; Huddy et al., 2015). Consequently, individuals who identify with a party have a greater incentive to vote in order to help the party.

Hypothesis 6. *Risk aversion (RA)* – Higher aversion to political risk reduces the likelihood of voting.

Non-participation in the electoral act can be seen as a retreat from the uncertainty of the elections (Nasr, 2021) and/or not depositing confidence (risking) in a candidate. Because risk-averse individuals tend to show less confidence in candidates and are more fearful of unfavorable outcomes (Attanasi et al., 2014), they are more prone to avoid participation in electoral acts. In addition, risk-averse individuals tend to have a moderate attitude towards political change which reflects preferences for less decisive voting rules (Attanasi et al., 2017).

Hypothesis 7. *Winning effect (WE)/losing effect (LE)* – Individuals who see their vote pass (fail)

on to the winning party, have higher (lower) levels of satisfaction and are more (less or equally) likely to vote in the subsequent election.

An election result may have repercussions on a loss (the case in which the vote did not translate into the election of the desired representative) or on a gain (the case in which the vote translated into the election of the desired representative), and it is known that individuals adopt different behaviors in the face of losses and gains (Kahneman & Tversky, 1979). Individuals who "lose" (i.e., the desired representative is not elected) the election experience a level of dissatisfaction higher than the satisfaction level they would experience had they "won" the election, revealing the behavior of aversion to loss about the negative result (Hansen et al., 2019). The same reasoning applies to the representatives themselves. Thus, an electoral winner will tend to have greater political support (Dahlberg & Linde, 2017) because it reveals a more optimistic view and may perform better politically (Anderson & Tverdova, 2001). A loser will tend to have less and less support. This effect may be stable over time, with a winner continually having more support than the loser (Dahlberg & Linde, 2017), since the individuals who voted for the losers of the election show lower levels of satisfaction than the winners (Anderson & Guillory, 1997; Curini et al., 2012), which will be reflected in negative effects in the subsequent elections. Notwithstanding, the effect of an electoral loss may be softened if the voter has already experienced a history of victories and/or has a strong ideological connection to the party (Curini et al., 2012). This explains why in H7 we do not take a definite position as for the losing effect.

Hypothesis 8. *Anchoring effect (AE)* – Individuals who are linked to a political party are more likely to vote in elections because they follow the tendency of the party.

As noted previously, political behavior is linked to party identification. However, this relationship may show links with an anchoring effect (herein consisting of making decisions based on past information, trusting the decisions of others, etc.; see, e.g., Attanasi et al., 2021, and the literature review therein). Identification with a party, ideology, and/or social, racial, and religious attitudes, may lead to a vote less introspective and closer to its identification (Bafumi & Shapiro, 2009), calling into question the rationality of the individual. For example, affective polarization has shown that voters tend to approach internal party groups and have more antagonistic behaviors towards outside party groups, which affects partisanship and ideological polarization (Wagner, 2021). Thus, the increased identification with a political group leads to behavior of greater hostility towards the opposing parties, thereby making the party with which it identifies itself more appealing (Iyengar & Krupenkin, 2018). This argument is related to the reciprocity between partisanship and the choice of voting (Hahn, 2009). By itself, the act of voting for a party

reinforces party attachment (Dinas, 2014). Moreover, the parties that win the elections see that the consent among them increase, translating into greater support (Nadeau & Blais, 2009). Thus, the communion of ideas and identifications amplifies the relationship between individuals (Schkade et al., 2010). From this discussion, we expect that the individuals belonging to/identified with a party behave more actively in the elections. In addition, it may be the case that individuals who ignore factual information and place (anchor) their convictions in a party, simply adopting the party's decisions as a reference (in a sense revealing incoherent behavior) are even more likely to vote. Thus, the anchoring effect contributes to the increased likelihood of voting, even if such a vote may be incoherent.

> Hypothesis 9. *Overconfidence (OV)* – Individuals who evaluate themselves with better self-rated political knowledge have a greater conviction in their knowledge and higher levels of overconfidence, increasing the likelihood of voting.

Another cognitive bias proposed in this work is overconfidence, which consists of individuals' tendency to overestimate their knowledge, skills, and abilities, thereby also increasing their propensity to make riskier decisions. Overconfidence is a characteristic that accompanies many individuals in their decisions, but overestimation of their competences can lead to less rational behaviors and have several impacts on political decisions. For example, it may affect voter preferences (Attanasi et al., 2014) by distorting judgement, as they may rely largely/only on their convictions leaving aside relevant factors and information. Thus, overconfidence may impact individuals' behavior in electoral participation and party identification (Ortoleva & Snowberg, 2015). Rabb et al. (2020) report on experimental results suggesting that less informed individuals are more prone to take more extreme positions and this behavior is more pronounced when the gap between perceived and objective knowledge increases.

As a final note, we use a self-reported variable to capture the intention of the vote, that is, we directly question respondents as to whether they voted in the last elections and whether they intend to vote in the next elections. We ignore that votes can be on different parties, but this factor has little impact on the decision to vote (Rogowski, 2014). Thus, to analyze the probability of voting we use the question "Did you vote in the last election?".

Finally, we represent the nine formulated hypotheses in the following summary diagram (Figure 1).

Data and methodology

Data

The data for this study was collected using an online questionnaire (announced on social networks-Facebook, and by e-mail) available during 6 days, from the 16th of July until the 21st of July 2021. We used previous research to design the questionnaire, and followed the methodological lines of Falk et al. (2016) in using questions to infer variables (such as trust, positive and negative reciprocity in their study). Table A.1 in the Online Appendix presents the questionnaire along with the dimensions each question purports to capture, the previous literature motivating them, their coding and acronym used herein.[1]

The questionnaire was initiated by 159 individuals, but only 119 were submitted. To ensure the reliability of the results, 13 individuals younger than 18 years old at the date of the last legislative elections in Portugal (the year 2019) were withdrawn since, at that time, they could not participate in the electoral act. Subsequently, it was found that 3 individuals submitted the questionnaire incomplete, and were removed from the working sample, ultimately comprising the responses from 103 individuals. Detailed descriptive statistics for all variables are presented in Tables A.2 and A.3 in the Online Appendix. Parcimoniously, we note that 41% of the individuals in the working sample identified as male; 84% of them voted in the last elections; and, on average, they are about 33 years old, ranging between 19 and 62 years old, at the time of the last election as referred to in the questionnaire. Note that, although the questionnaire was run online during one of the several waves of COVID-19 in Europe, a plethora of experimental studies have proved the reliability of self-reported measures of idiosyncratic features, risk-related attitudes, overconfidence and social preferences through online questionnaires during the COVID-19 outbreak, despite its side-effects (see, among others, Alifano et al., 2020; Attanasi et al., 2021; Buso et al., 2020, 2021; Cherick et al., 2020).

Methodology

As noted from the previous literature review, the act of voting depends on a set of dimensions/factors. However, the quantification of these dimensions is not always direct/straightforward. Factor analysis (Kyriazos, 2018; Rodriguez et al., 2017) is an approach/method often used to quantify the latent dimensions of an unobservable variable, and we note that its proper implementation requires a set of tests, such as Cronbach's alpha coefficient, the Bartlett test of sphericity test, and the Kaiser-Meyer-Olkin Measure (Hair et al., 2009). Additionally, it is necessary to ensure that the method fits the measurement nature/type of the variables (such as the ordinal category as in the present analysis). Taking these briefly summarized methodological observations into account, we use the polychoric correlation matrix (Holgado-Tello et al., 2010) as a specification in the exploratory factor analysis. Concerning the extraction methods, we use the principal factors method aimed at quantifying cognitive dimensions, beliefs, and behaviors (Acock, 2018). Subsequently, we apply a varimax orthogonal rotation procedure hardwired in the Stata software. Based on these results, the factors are denominated according to the factor loadings that present the highest value, and we

---

[1]The Online Appendix is available at the address onlineappendixdvt.web.ua.pt/DVT/OnlineAppendix.pdf.
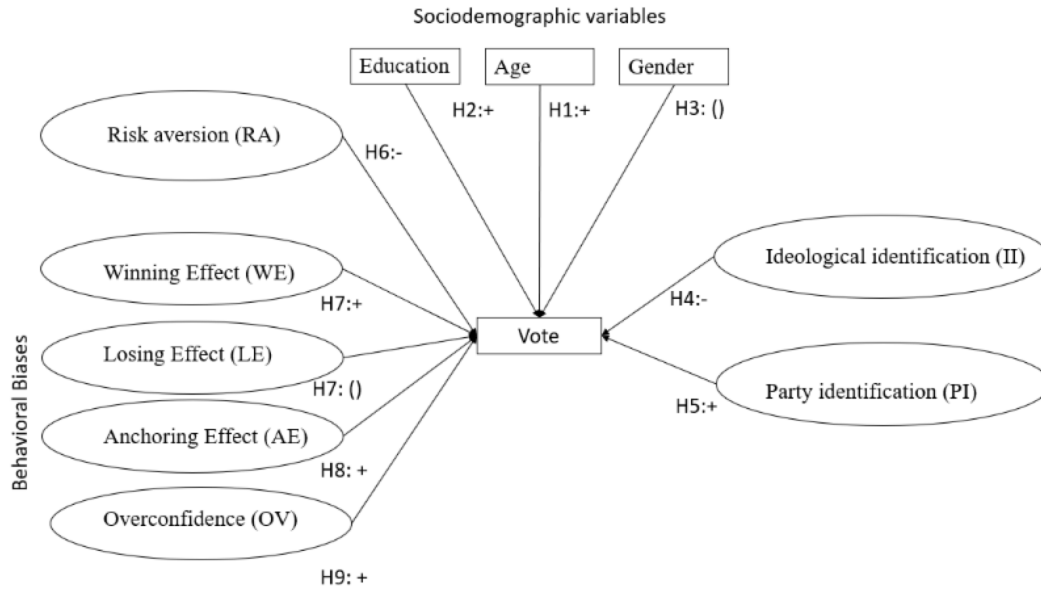
Figure 1. Representation of the formulated hypotheses
Note: The circumferences represent the latent variables that are to be assessed. The rectangles symbolize the observed variables. "H" represents the hypotheses under study in this article. The "+" corresponds to a positive expected sign; "-" to a negative sign; and "()" to a non-significant effect.

exclude the variables that present factor loadings below 0.4 (Hair et al., 2009) which requires the execution of the method several times as they are removed from the factor analysis. Finally, the factors (latent dimensions) themselves are estimated by the scoring coefficients method (technically: method = regression; based on varimax rotated factors).

Once these factors/dimensions are quantified, we analyse the determinants of voter turnout using individuals' answer to the question "Did you vote in the last election?" as the response/dependent variable in the multivariate analysis. This variable is coded with the unit value for individuals who answered "yes" to the question, and takes the zero value otherwise. Due to the dichotomous nature of the response variable, the determinants of voter turnout are estimated using a logit specification/model. This model allows the maximum likelihood estimation of the probability that voter turnout occurs, properly bounded between 0 and 1, by predicting the dichotomous outcome from a set of explanatory variables, and is widely used when response variables are binary (Long & Freese, 2014). In the present work, the equation of the model is given by the expression:

$$
\begin{aligned}
P\,(Y_i = 1 | gender_i, educ_i, age_i, income_i, \\
OV_i, AE_i, RA_i, WE_i, LE_i, PI_i, II_i) = \\
\frac{e^{\beta_0 + \beta_1 gender_i, + \beta_2 educ_i, + \beta_3 age_i, + \beta_4 income_i, + \beta_5 OV_i, + \beta_6 AE_i,}}{1 + e^{\beta_0 + \beta_1 gender_i, + \beta_2 educ_i, + \beta_3 age_i, + \beta_4 income_i, + \beta_5 OV_i, + \beta_6 AE_i,}} \\
 {}^{+ \beta_7 RA_i, + \beta_8 WE_i, + \beta_9 LE_i, + \beta_{10} PI_i, + \beta_{11} II_i} \\
\overline{ {}^{+ \beta_7 RA_i, + \beta_8 WE_i, + \beta_9 LE_i, + \beta_{10} PI_i, + \beta_{11} II_i}}
\end{aligned}
\tag{1}
$$

where, P is the probability of the event given a set of explanatory variables (gender, education, age, income (the income variable is used as a control variable), OV, AE, RA, WE, LE, PI, and II – see Figure 1), e is the exponential function and the β_j are parameters to be estimated. Because the probability function above is nonlinear, the parameter estimates do not directly measure the effect of a change in the associated explanatory variables on the mean of the dependent variable. We, therefore, estimate the average marginal effects of the explanatory variables to assess the magnitude of their impact, and its statistical significance, on the probability of voter turnout.

Results

Following the observations in the methodological section, we used the Cronbach's alpha coefficient to measure reliability, which presents a coefficient of 0.907 deemed acceptable in the literature (Hair et al., 2009); the null hypothesis in the Bartlett test of sphericity is rejected ($\chi^2 = 2758.08$, p-value < 0.001); and the Kaiser-Meyer-Olkin measure of sample adequacy has a value of 0.81 that is deemed meritorious (Acock, 2018; Kaiser, 1974). The results of these tests support the validity of the factor analysis in our data. From the application of the factor analysis, we found that the variables pi_4, ra_1, and ra_3 presented factor loadings after rotation below 0.4 and, as a consequence, we removed them from the analysis, performing the whole process a second time. The results from this second round of factor analysis and rotation, revealed that all variables had factor loadings greater than 0.4 as shown in Panel B of

	analysis/correlation
Factor	analysis/correlation
Method:	principal factors
Rotation:	orthogonal varimax

	F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8	F 9	F 10	F 11	F 12
Variance	5.548	2.774	2.408	2.197	2.140	1.756	1.170	0.933	0.401	0.355	0.336	0.285
Difference	2.774	0.366	0.210	0.058	0.384	0.586	0.237	0.532	0.046	0.019	0.051	0.014
Proportion	0.274	0.137	0.119	0.109	0.106	0.087	0.058	0.046	0.020	0.018	0.017	0.014
Cumulative	0.274	0.411	0.530	0.639	0.744	0.831	0.889	0.935	0.955	0.972	0.989	1.003

B) Rotated factor loadings (pattern matrix) and unique variances*

	F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8	F 9	F 10	F 11	F 12	Uniqueness
pi_1	0.442					0.472							0.224
pi_2						0.767							0.111
pi_3						0.735							0.197
we_1				0.815									0.211
we_2					0.833								0.164
we_3				0.696									0.320
le_1				0.792									0.198
le_2					0.814								0.195
le_3					0.566								0.382
ra_2										0.512			0.625
ra_4			0.742										0.239
ra_5			0.857										0.142
ra_6			0.803										0.248
ae_1		0.866											0.157
ae_2		0.933											0.016
ae_3		0.609									0.406		0.381
ae_4		0.647							0.522				0.135
ov_1	0.874												0.109
ov_2	0.927												0.051
ov_3	0.926												0.069
ov_4	0.877												0.110
ov_5	0.780												0.210
ov_6	0.592										0.487		0.216
ii_1							0.716						0.272
ii_2	0.615						0.526						0.207
ii_3								0.629					0.325
ii_4								0.501					0.386

Note: Table A. in the Online Appendix presents the questions associated with the different variables, and their code. The polychoric correlation matrix is also available in Table A.4 in the Online Appendix. *The blank spaces in Panel B correspond to factor loadings less than 0.4.

Table 1. 1. Factor analysis result - Panel B

C) Scoring coefficients (method = regression; based on varimax rotated factors)

	F 1	F 2	F 3	F 4	F 5	F 6	F 7
pi_1	-0.017	-0.141	0.079	0.019	-0.050	0.079	0.250
pi_2	-0.061	-0.118	0.015	-0.120	-0.077	0.788	-0.097
pi_3	-0.042	0.000	-0.070	0.027	-0.022	0.363	0.006
we_1	-0.049	-0.070	0.036	0.455	0.016	-0.098	-0.026
we_2	-0.011	-0.004	-0.057	-0.005	0.511	-0.093	0.000
we_3	-0.045	0.132	-0.051	0.232	-0.041	-0.007	0.075
le_1	-0.039	0.091	-0.049	0.405	0.006	-0.065	-0.126
le_2	-0.030	-0.112	0.042	-0.024	0.472	-0.113	-0.077
le_3	-0.031	-0.118	0.057	0.044	0.133	-0.007	0.021
ra_2	0.000	0.022	0.024	-0.011	-0.046	0.028	0.044
ra_4	0.023	0.117	0.161	0.006	0.006	-0.038	-0.037
ra_5	-0.040	-0.132	0.564	-0.003	-0.068	0.004	0.038
ra_6	0.046	0.169	0.185	-0.016	0.001	-0.067	-0.234
ae_1	-0.076	0.029	0.175	0.129	-0.003	-0.108	0.218
ae_2	0.194	1.406	-0.607	-0.208	-0.119	-0.054	-0.719
ae_3	-0.019	-0.072	0.092	0.030	0.000	-0.015	0.103
ae_4	-0.087	-0.309	0.268	0.105	-0.028	-0.018	0.385
ov_1	0.195	-0.170	0.272	-0.107	-0.157	0.121	0.151
ov_2	0.400	0.273	-0.333	-0.065	0.058	-0.130	-0.419
ov_3	0.318	0.133	-0.149	-0.062	0.050	-0.109	-0.260
ov_4	0.158	-0.118	0.139	-0.033	-0.036	-0.028	0.005
ov_5	0.120	0.066	-0.038	-0.033	0.062	-0.182	-0.029
ov_6	-0.025	-0.195	0.146	0.019	-0.062	0.061	0.195
ii_1	0.008	0.191	-0.145	-0.051	0.013	-0.031	0.405
ii_2	-0.027	-0.208	0.055	0.035	-0.037	0.006	0.542
ii_3	-0.044	-0.080	0.041	0.071	0.001	-0.048	0.110
ii_4	-0.006	0.023	-0.009	-0.067	0.002	0.028	-0.069

Table 1. 2. Factor analysis result - Panel C

Table 1, allowing us to identify 7 factors representing the latent dimensions previously proposed as explanatory for voter turnout. Panel C in Table 2 presents the coefficients used to estimate these 7 factors.

Following this identification, we proceeded with the analysis and renamed the factors according to the dimensions they are capturing. Accordingly, we observe that factor 1 presents 8 variables with factor loadings above 0.4, and 6 of these variables are related to self-assessment issues and individuals' comparison of political knowledge. Thus, this factor is used to quantify *overconfidence*, thereby renamed OV. Factor 2 presents 4 variables with loads greater than 0.6, and these variables refer to issues related to the tendency to follow the party's lines/decisions, ignoring contradictory information or knowledge. This factor, therefore, presents strong links to the *anchoring effect* and, as such, is renamed AE. Factor 3 presents 3 variables related to the dimension of *risk pref-*

erences concerning political decisions, and is renamed RA. Factor 4 presents 3 variables with loads greater than 0.6, two of them being representative of the *winning effect* and one of the losing effect. This result reveals that individuals devalue the loss of elections when the party performs well during the mandate believing in it in the following elections. Thus, a good performance is seen as a win, and factor 4 is renamed as WE. Factor 5 presents 3 variables with factor loads above 0.5, with two of them referring to the *loss effect* and one referring to the *gain effect*, revealing that a party that wins the elections, but that presents a poor performance, will be seen as a loser and, consequently, will see its support decrease in the subsequent elections. Thus, factor 5 will be renamed LE. Factor 6 contains 3 variables with loads greater than 0.4, all of them referring to the dimension of party identification, and is, therefore, renamed PI. Lastly, factor 7 presents 2 variables with loads above 0.4 referring to the dimension of ideological

identification, and is renamed II.

Table **??** presents descriptive statistics for all these dimensions, along with the interpretation that is to be given to changes in their numeric values. From this exercise, we also note that although some differences were found between the expected dimensions for some variables and their dimensions as attributed by the exploratory factor analysis (Table A.5 in the Online Appendix details these differences), we observe that 22 out of 30 variables validated the structure proposed in the questionnaire design.

Maximum likelihood estimates of the average marginal effects of the explanatory variables (regressors) on the probability of voter turnout are provided in Table 3 (Table A.6 in the Online Appendix provides the coefficient estimates). Model 1 in Table 3 includes sociodemographic explanatory variables only, and Model 2 additionally includes the dimensions in Table **??**. The results show that both models are globally significant at the 1% significance level, but that Model 2 provides the best adjustment based both on the AIC and the BIC criteria, revealing that the inclusion of these dimensions is relevant for the explanation of the probability of voting.

Turning to the interpretation of the average marginal effects in Model 2, we observe that individuals' gender has no statistically significant effect on the probability of voting. This result is in line with the result reported by Magni (2017), and supports our hypothesis 3, suggesting that, *ceteris paribus*, gender inequalities in voter participation have been decreasing over time. Concerning the effect of formal education, the results reveal that individuals with secondary education and higher education are less likely to vote than individuals with primary and basic education (the omitted category), and other education levels have no differentiated impacts when compared to the omitted category. While similar results have been previously reported in the literature (Magni, 2017), this finging refutes our hypothesis 2, suggesting that, all else the same, more years of formal education is not reflected in higher electoral participation. Likewise, we observe that age has a negative, but non-significant, effect on the probability of voting. While this negative effect could be explained by decreases in physical and/or cognitive capacities limiting the intention/willingness to vote by older individuals, or by a higher sense of discontent with the political system because they might have experienced poor government performances for longer periods, the overall result refutes our hypothesis 1 postulating that increasing age would positively contribute to voter turnout. Still focusing on the effects of sociodemographic factors, the results show that, *ceteris paribus*, increases in the individuals' income leads to an increase in the probability of voting. This result may be associated with the fact that individuals with higher income levels tend to be more aware of law changes (e.g., laws related to personal income tax) which increases their interest in political issues, a finding that is in line with that reported by Gallego (2007).

Of primary interest in Table 3 are the effects of the variables pertaining to cognitive biases and risk preferences. We find that risk aversion and two cognitive biases significantly affect the probability of voting, evidencing their relevance in the analysis of individuals' political behavior as indicated by Schnellenbach and Schubert (2015). Concerning the variable RA, the results indicate that increasing risk tolerance (the RA variable takes higher values) leads to an increased probability of voting, supporting our hypothesis 6. This means that individuals who are more tolerant to political risk are more willing to vote, and, conversely, those who are more risk-averse exhibit a lower probability of voting as postulated in hypothesis 6. This result reinforces the idea that risk-averse individuals tend to fear political changes (Iyengar et al., 2019), and may avoid voter participation (Attanasi et al., 2014), suggesting that one of the causes of abstention is risk-aversion behavior. With respect to the impact of the variable WE, the results reveal a positive and significant effect on the probability of voting. This suggests that individuals who voted for the party that was previously elected experience positive feelings and turnout in the subsequent election (Dahlberg & Linde, 2017), a finding that also corroborates the evidence that electoral winners tend to have more support in the subsequent elections (Anderson & Tverdova, 2001). The results in Table 3 also reveal that the variable LE has no significant effect on the probability of voting, supporting the thought that after a loss of elections there is a decrease in political support (Dahlberg & Linde, 2017), decreased voters' satisfaction (Anderson & Guillory, 1997; Curini et al., 2012) and increased aversion to loss (Hansen et al., 2019). Thus, taken together, the estimated effects of the variables WE and LE on the probability of voting support our hypothesis 7.

The results in Table 5 also support our hypothesis 9 in light of the positive and statistically significant impact of the variable OV on the probability of voting. A similar result is found in earlier research by Ortoleva & Snowberg (2015) who suggest that individuals who are overly confident in their own skills and knowledge also are more confident in their political views, a factor that increases their propensity to vote, even if such overconfidence may ultimately harm voter preferences as they rely too heavily in their own convictions, neglecting relevant factors and information (Attanasi et al., 2017).

Looking at how party identification affects the likelihood of voting, we observe that the PI variable has a positive, but not significant, effect on the probability of voting. We expected a positive effect (hypothesis 5) given that individuals who identify with a party tend to have more interest in political and electoral issues (Huddy et al., 2015), to derive more satisfaction from the political system (Barbet, 2020), and to experience the political results more intensely (Huddy et al., 2015; Greene, 2000), all of which contribute to higher participation in elections. Our findings, however, do not fully support this hypothesis. On the other hand, the observed negative effect of ideological identification (II) on the probability of voting supports our hypothesis 4. This result may be a consequence of a divergence between the ideological principles of individuals and the principles of political parties participating

Name	Factor	Count	Mean	sd	min	max	Interpretation
OV	Factor 1	103	4.143	1.829	-0.745	7.327	The increase in the variable reflects an increase in OV
AE	Factor 2	103	2.476	3.144	-1.734	12.654	The increase in the variable reflects an increase in AE
RA	Factor 3	103	2.170	2.286	-4.018	7.141	The increase in the variable reflects a *decrease* in RA
WE	Factor 4	103	6.469	2.638	-1.353	10.364	The increase in the variable reflects an increase in WE
LE	Factor 5	103	0.997	2.575	-3.087	9.149	The increase in the variable reflects a *decrease* in LE
PI	Factor 6	103	1.436	2.745	-3.806	7.961	The increase in the variable reflects an increase in the PI
II	Factor 7	103	2.597	2.404	-3.957	10.030	The increase in the variable reflects an increase in II

Table 2. Descriptive statistics of dimensions

in the elections since the increase in ideological conflict can contribute to a decrease in electoral participation (Rogowski, 2014). Finally, we observe that the variable capturing the anchoring effect (AE) is not statistically significant suggesting that, ceteris paribus and against our hypothesis 8, belief in a party (group) does not affect the probability of voter turnout.

Conclusions

The existing literature suggests that voter participation is affected by several relevant factors, namely the characteristics of individuals, ideological identification, party identification, risk aversion, and cognitive biases. There is however a paucity of empirical studies assesing the impact of each of these factors on voter participation while controlling for the effects of the other, also relevant, factors. The present study contributes to this literature using factor analysis to quantify the latent factors and, subsequently, estimating a Logit model to assess the causal relationship between these factors (and other observable variables) and voter participation. The results of this study reveal that the probability of voting is affected by sociodemographic factors (such as individuals' income), ideological identification, attitudes towards political risk, and cognitive biases (overconfidence, and winning effect). Importantly, we find that, all else the same, individuals more averse to political risk are less likely to vote, a factor that might partially explain abstention in elections. On the other hand, overconfidence and the winning effect have a positive impact on the likelihood of voting. Thus, individuals who are overconfident about their own knowledge, and individuals who have experienced previous positive results (winning the elections or the party they voted for performed well during the election period) are, holding other factors constant, more likely to vote. We note, however, that while these two cognitive biases reduce voter abstention, they may also be responsible for incoherent votes.

Limitations

While every empirical study has its limitations, two associated with the present study must be particularly kept in mind when evaluating its findings. First, the findings reported in the study are limited by the relatively small sample size, namely precluding the application of more complex method-

ologies such as the Generalized Structural Equation Modeling (GSEM). Second, several important factors thought to affect voter turnout were not included in the present analysis, such as those pertaining to confidence in the electoral process and the political system (Lundmark et al., 2020), civic duty (Feitosa et al., 2020), corruption (Dahlberg et al., 2015), feelings of anger (Magni, 2017), and trust and stability of democracy (Norris, 2019). Addressing these limitations must be left for future studies.

Declarations

Acknowledgments

References

Acock, A. C. (2018). *A Gentle Introduction to Stata* (6th ed.). Stata Press, 4905 Lakeway Drive, College Station, Texas 77845.

Ahlskog, R. (2021). Education and voter turnout revisited: Evidence from a Swedish twin sample with validated

turnout data. *Electoral Studies, 69*(102186).

Alifano, M., Attanasi, G., Iannelli, F., Cherikh, F., & Iannelli, A. (2020). COVID-19 pandemic: A European perspective on health economic policies. *Journal of Behavioral Economics for Policy, 4*, 35-43.

Anderson, C. J., & Guillory, C. A. (1997). Political institutions and satisfaction with democracy: A Cross-National Analysis of Consensus and Majoritarian Systems. *The American Political Science Review, 91*(1), 66–81.

Anderson, C. J., & Tverdova, Y. V. (2001). Winners, losers, and attitudes about government in contemporary democracies. *International Political Science Review, 22*(4), 321–338.

Anderson, L. R., Holt, C. A., Sieberg, K. K., & Freeborn, B. A. (2022). An experimental study of strategic voting and accuracy of verdicts with sequential and simultaneous voting. *Games, 13*(2), 26.

Attanasi, G., Corazzini, L., Georgantzís, N., & Passarelli, F. (2014). Risk aversion, overconfidence and private information as determinants of majority thresholds. *Pacific Economic Review, 19*(3), 355–386.

Attanasi, G., Corazzini, L., & Passarelli, F. (2017). Voting as a lottery. *Journal of Public Economics, 146*, 129–137.

Attanasi, G., Boun My, K., Guido, A., & Lefebvre, M. (2021). Controlling monopoly power in a double-auction market experiment. *Journal of Public Economic Theory, 23*, 1074–1101.

Attanasi, G., Maffioletti, A., Shalukhina, T., Bel, C., & Cherikh, F. (2021). Gender differences in the impact of COVID-19 lockdown on potentially addictive behaviors: An emotion-mediated analysis. *Frontiers in Psychology, 12*, 703897.

Baddeley, M. (2017). Experts in policy land - Insights from behavioral economics on improving experts' advice for policy-makers. *Journal of Behavioral Economics for Policy, 1*(1), 27–31.

Bafumi, J., & Shapiro, R. Y. (2009). A new partisan voter. *The Journal of Politics, 71*, 1–24.

Barbet, B. (2020). Nobody seems to be fully representing me: Differential inter-attitudinal cohesion systems and their effects on satisfaction with the political system. *Electoral Studies, 64*, 102116.

Beblo, M., Beninger, D., & Markowsky, E. (2017). It's education, not gender: A research note on the determinants of an anchoring bias in experimental WTA elicitations. *Journal of Behavioral Economics for Policy, 1*(2), 51–55.

Best, R. E., & Seyis, D. (2021). How do voters perceive ideological congruence? The effects of winning and losing under different electoral rules. *Electoral Studies, 69*, 102201.

Buso, I. M., De Caprariis, S., Di Cagno, D., Ferrari, L., Larocca, V., Marazzi, F., ... & Spadoni, L. (2020). The effects of COVID-19 lockdown on fairness and cooperation: Evidence from a lablike experiment. *Economics Letters, 196*, 109577.

Buso, I. M., Di Cagno, D., Ferrari, L., Larocca, V., Lorè, L., Marazzi, F., ... & Spadoni, L. (2021). Lab-like findings from online experiments. *Journal of the Economic Science Association, 7*(2), 184-193.

Carreras, M. (2018). Why no gender gap in electoral participation? A civic duty explanation. *Electoral Studies, 52*, 36–45.

Cherikh, F., Frey, S., Bel, C., Attanasi, G., Alifano, M., & Iannelli, A. (2020). Behavioral food addiction during lockdown: time for awareness, time to prepare the aftermath. *Obesity Surgery, 30*, 3585–3587.

Coffé, H., & Bolzendahl, C. (2010). Different rules? Gender differences in political participation. *Sex Roles, 62*, 318–333.

Cooper, W. W., Kingyens, A. T., & Paradi, J. C. (2014). Two-stage financial risk tolerance assessment using data envelopment analysis. *European Journal of Operational Research, 233*(1), 273–280.

Cravens, M. D. (2020). Measuring the strength of voter turnout habits. *Electoral Studies, 64*(November 2019), 102117.

Crowder-Meyer, M., Gadarian, S. K., Trounstine, J., & Vue, K. (2020). A different kind of disadvantage: candidate race, cognitive Ccmplexity, and voter choice. *Political Behavior, 42*, 509–530.

Curini, L., Jou, W., & Memoli, V. (2012). Satisfaction with democracy and the winner/loser debate: The role of policy preferences and past experience. *British Journal of Political Science, 42*(2), 241–261.

Dahlberg, S., & Linde, J. (2017). The dynamics of the winner – loser gap in satisfaction with democracy: Evidence from a Swedish citizen panel. *International Political Science Review, 38*(5), 625–641.

Dahlberg, S., Linde, J., & Holmberg, S. (2015). Democratic discontent in old and new democracies: Assessing the importance of democratic input and governmental output. *Political Studies, 63*(s1), 18–37.

de Palma, A., Abdellaoui, M., Attanasi, G., Ben-Akiva, M., Fehr-Duda, H., Erev, I., Fok, D., Fox, C.R., Hertwig, R., Picard, N., Wakker, P.P., Walker, J.L. and M. Weber (2014). Beware of black swans: Taking stock of the description-experience gap in decision under uncertainty. *Marketing Letters, 25*, 269–280.

Dinas, E. (2014). Does choice bring loyalty? Electoral participation and the development of party identification. *American Journal of Political Science, 58*(2), 449–465.

Falk, A., Becker, A., Dohmen, T., Huffman, D., & Sunde, U. (2016). The preference survey module: A validated instrument for measuring risk, time, and social preferences. *IZA Discussion Paper* No. 9674, (9674).

Feitosa, F., Stiers, D., & Dassonneville, R. (2020). A cause or a consequence? A quasi-experimental test of the duty-participation nexus. *Journal of Elections, Public Opinion and Parties,* 1–10.

Gallego, A. (2007). *Inequality in Political Participation: Contemporary Patterns in European Countries.* UC Irvine: Center for the Study of Democracy.

Garry, J. (2007). Making 'party identification' more versatile: Operationalising the concept for the multiparty setting. *Electoral Studies, 26*, 346–358.

Gerber, A. S., Huber, G. A., Doherty, D., & Dowling, C. M. (2012). Personality and the strength and direction of partisan identification. *Political Behavior, 34*, 653–688.

Goerres, A. (2007). Why are older people more likely to vote? The impact of ageing on electoral Turnout in Europe. *The British Journal of Politics and International Relations, 9*, 90–121.

Goggin, S. N., Henderson, J. A., & Theodoridis, A. G. (2020). What goes with red and blue? Mapping partisan and ideological associations in the minds of voters. *Political Behavior, 42*, 985–1013.

Greene, S. (2000). The psychological sources of partisan-leaning independence. *American Politics Quarterly, 28*(4), 511–537.

Hahn, V. (2009). Reciprocity and voting. *Games and Economic Behavior, 67*, 467-480.

Hair, J. J. F., Black, W. C., Barry, J. B., Rolph, E. A., & Ronald, L. T. (2009). *Multivariate data Analysis* (6th ed.). Pearson Education, Inc.

Hansen, E. R., & Tyner, A. (2021). Educational attainment and social norms of voting. *Political Behavior, 43*(2), 711–735.

Hansen, S. W., Klemmensen, R., & Serritzlew, S. (2019). Losers lose more than winners win: Asymmetrical effects of winning and losing in elections. *European Journal of Political Research, 58*, 1172–1190.

Holgado–Tello, F. P., Chacón–Moscoso, S., Barbero–García, I., & Vila–Abad, E. (2010). Polychoric versus Pearson correlations in exploratory and confirmatory factor analysis of ordinal variables. *Quality and Quantity, 44*(1), 153–166.

Huddy, L., Mason, L., & Aarøe, L. (2015). Expressive partisanship: Campaign involvement, political emotion, and partisan identity. *American Political Science Review, 109*(1), 1–17.

Inbar, Y., & Lammers, J. (2012). Political diversity in social and personality psychology. *Perspectives on Psychological Science, 7*(5), 496–503.

Iyengar, S., & Krupenkin, M. (2018). The strengthening of partisan affect. *Advances in Political Psychology, 39*(1), 201–218.

Iyengar, S., Lelkes, Y., Levendusky, M., Malhotra, N., & Westwood, S. J. (2019). The origins and consequences of affective polarization in the United States. *Annual Review of Political Science, 22*, 129–146.

Ji, C., & Jiang, J. (2020). Enlightened one-party rule? Ideological differences between Chinese Communist Party Members and the Mass Public. *Political Research Quarterly, 73*(3), 651 –666.

Jost, J. T. (2006). The end of the end of ideology. *American Psychologist, 61*(7), 651–670.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An Analysis of Decision under Risk. *Econometrica, 47*(2), 263–292.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*, 31–36.

Kölln, A.-K., & Polk, J. (2017). Emancipated party members: Examining ideological incongruence within political parties. *Party Politics, 23*(1), 18–29.

Ksiazkiewicz, A. (2021). Political ideology and diurnal associations: A dual-process motivated social cognition account. *Politics and the Life Sciences, 40*(1), 56–71.

Kyriazos, T. A. (2018). Applied psychometrics: Writing-Up a factor analysis construct validation study with examples. *Psychology, 9*, 2503–2530.

Long, J. S., & Freese, J. (2014). *Regression models for categorical dependent variables using STATA* (Third Edition). Stata Press.

Lundmark, S., Oscarsson, H., & Weissenbilder, M. (2020). Confidence in an election authority and satisfaction with democracy: Evidence from a quasi-natural experiment of a failed election in Sweden. *Electoral Studies, 67*, 102216.

Magni, G. (2017). It's the emotions, Stupid! Anger about the economic crisis, low political efficacy, and support for populist parties. *Electoral Studies, 50*, 91–102.

Mondak, J. J., & Halperin, K. D. (2014). A framework for the study of personality and political behaviour. *British Journal of Political Science, 38*(2), 335–362.

Mousavi, S., & Kheirandish, R. (2017). Policy making with behavioral insight. *Journal of Behavioral Economics for Policy, 1*(1), 41–46.

Nadeau, R., & Blais, A. (2009). Accepting the Election Outcome: The effect of participation on losers' consent. *British Journal of Political Science, 23*(04), 553–563.

Nasr, M. (2021). The motivated electorate: Voter uncertainty , motivated reasoning , and ideological congruence to parties. *Electoral Studies, 72*, 102344.

Navarrete, R. M. (2021). Go the distance: left-right orientations , partisanship and the vote the vote. *European Politics and Society, 22*(3), 451–469.

Norris, P. (1991). Diferenças de gênero na participação política na Grã-Bretanha: modelos tradicionais, radicais e revisionistas. *Government and Opposition, 26*(1), 56–74.

Norris, P. (2019). Do perceptions of electoral malpractice undermine democratic satisfaction? The US in comparative perspective. *International Political Science Review, 40*(1), 5–22.

Ortoleva, P., & Snowberg, E. (2015). Overconfidence in Political Behavior. *American Economic Review, 105*(2), 504–535.

Panagopoulos, C., & Abrajano, M. A. (2014). Life-cycle effects on social pressure to vote. *Electoral Studies, 33*, 115–122.

Pennington, N., & Winfrey, K. L. (2021). Engaging in political talk on Facebook: Investigating the role of interpersonal goals and cognitive engagement. *Communication Studies, 72*(1), 100–114.

Pennycook, G., & Rand, D. G. (2019). Cognitive reflection and the 2016 U.S. Presidential Election. *Personality and Social Psychology Bulletin, 45*(2), 224 –239.

Rabb, N., Han, J. J., & Sloman, S. A. (2020). How others drive our sense of understanding of policies. *Behavioural Public Policy*, 1–26.

Rodriguez, C. G., Moskowitz, J. P., Salem, R. M., & Idem, P. H. (2017). Partisan selective exposure: The role of party, ideology and ideological extremity over time. *Translational Issues in Psychological Science, 3*(3), 254–271.

Rogowski, J. C. (2014). Electoral choice, ideological conflict, and political participation. *American Journal of Political Science, 58*(2), 479–494.

Schkade, D., Sunstein, C. R., & Hastie, R. (2010). When deliberation produces extremism. *Critical Review, 22*(2–3), 227–252.

Schnellenbach, J., & Schubert, C. (2015). Behavioral political economy: A survey. *European Journal of Political Economy, 40*, 395–417.

Smets, K. (2021). "Aging and politics: age differences in political behavior in comparative perspective." In *Handbook of Aging and the Social Sciences* (Ninth Edition), (pp. 287–300). Academic Press.

Soon, X. (2017). Response to applying behavioural science to government policy: Finding the 'Goldilocks Zone': From a BI unit perspective. *Journal of Behavioral Economics for Policy, 1*, 15–18.

Tappin, B. M., Pennycook, G., & Rand, D. G. (2020). Bayesian or biased? Analytic thinking and political belief updating. *Cognition, 204*, 104375.

Theodoridis, A. G. (2017). Me, Myself, and (I), (D), or (R)? Partisanship and political cognition through the lens of implicit identity. *The Journal of Politics, 79*(4), 1253-1267.

Wagner, M. (2021). Affective polarization in multiparty systems. *Electoral Studies, 69*(102186).

Ward, D. G., & Tavits, M. (2019). How partisan affect shapes citizens' perception of the political world. *Electoral Studies, 60*, 102045.