## Supplementary material

## Appendix A: German wording and English translations and descriptive measures of the dependent and independent variables

## Appendix B: Additional analyses

## Appendix C: Validation of the dependent variable

## Appendix A: German wording and English translations and descriptive measures of the dependent and independent variables

Table A1: German wording and English translations of the dependent and independent variables

| **German item in the questionnaire** | **English translation** |
| --- | --- |
| ***Use of negative campaigning*** |
| Und wie häufig haben Sie den politischen Gegner angegriffen, d.h. Kritik an anderen Parteien oder Personen geübt? | How often have you attacked your political opponents, i.e., criticized other parties or individuals? |
|  |  |
| ***Benefits of negative camapigning*** |  |
| Wie groß sind Ihrer Meinung nach die Vorteile, die mit einem Angriff auf den politischen Gegner verbunden sind? | In your opinion, how great are the advantages of attacking your political opponent? |
|  |  |
| ***Costs of negative campaigning*** |  |
| Wie groß sind Ihrer Meinung nach die Nachteile, die mit einem Angriff auf den politischen Gegner verbunden sind? | In your opinion, how great are the disadvantages of attacking your political opponent? |
|  |
| ***Basic personality traits (BHI-24 short-scale)*** |
| *Honesty-humility* |  |
| Es fällt mir schwer, zu lügen. | It's hard for me to lie. |
| Geld sollte man nur auf ehrliche Art und Weise verdienen. | Money should only be earned in an honest way. |
| Ich würde gerne berühmt werden.  | I would like to become famous.  |
| Ich habe es mehr als andere verdient, gut behandelt zu werden.  | I deserve to be treated well more than others.  |
| *Emotionality* |  |
| Ich habe Angst, verletzt zu werden. | I am afraid of being hurt. |
| Ich mache mir weniger Sorgen als andere.  | I worry less than others.  |
| Ich kann Schwierigkeiten leicht alleine überwinden.  | I can easily overcome difficulties on my own.  |
| Ich muss weinen, wenn ich traurige oder romantische Filme sehe. | I cry when I watch sad or romantic movies. |
| *Extraversion* |  |
| Andere reden nicht gern mit mir.  | Others don't like to talk to me.  |
| Ich komme leicht in Kontakt mit Fremden. | I can easily get into contact with strangers. |
| Ich rede gerne mit anderen. | I like to talk to others. |
| Ich bin selten aufgeregt.  | I am rarely excited.  |
| *Agreeableness* |  |
| Ich bin unfreundlich zu jemandem, der gemein zu mir war.  | I am not friendly to someone who has been mean to me.  |
| Ich übe oft Kritik an anderen.  | I often criticize others.  |
| Ich stimme schnell mit anderen Personen überein. | I am quick to agree with others. |
| Ich bleibe ruhig, auch wenn ich schlecht behandelt werde. | I remain calm even when I am treated badly. |
| *Conscientiousness* |  |
| Ich sorge stets dafür, dass alle Dinge an ihrem Ort sind. | I always make sure that all things are in their place. |
| Ich schiebe schwierige Aufgaben so lange wie möglich auf.  | I delay difficult tasks as long as possible.  |
| Ich arbeite sehr genau. | I work very accurately. |
| Ich tue oft Dinge, ohne darüber nachzudenken.  | I often do things without thinking about them.  |
| *Openness* |  |
| Ich kann ein Gemälde lange betrachten. | I can look at a painting for a long time. |
| Ich finde Wissenschaft langweilig. | I consider science to be boring. |
| Ich habe viel Fantasie. | I have a lot of imagination. |
| Ich mag Menschen mit seltsamen Ideen. | I like people with odd ideas. |
|  |  |
| ***Aversive personality (PEAPS short scale)*** |
| Ich habe schon mal kleine Nachteile in Kauf genommen, um eine Person zu bestrafen, die es verdiente. | There have been times when I was willing to suffer some small harm so that I could punish someone else who deserved it |
| Es ist ratsam, Informationen im Auge zu behalten, die man später gegen andere verwenden kann. | It’s wise to keep track of information that you can use against people later |
| Es gibt Dinge, die du vor anderen Menschen verbergen solltest, um dein Ansehen zu wahren. | There are things you should hide from other people to preserve your reputation |
| Ich beharre darauf, den Respekt zu bekommen, den ich verdiene. | I insist on getting the respect I deserve |
| Ich will, dass meine Konkurrenten scheitern. | I want my rivals to fail  |
| Menschen bereuen es immer, wenn sie sich mit mir anlegen. | People who mess with me always regret it |
| **Values** |  |
| *Achievement* |  |
| Meine Fähigkeiten zu zeigen; danach zu streben, dass die Leute bewundern, was ich tue. | To show my abilities; to strive for people to admire what I do. |
| Sehr erfolgreich zu sein; andere Leute zu beeindrucken. | To be very successful; to impress other people. |
| Ehrgeizig zu sein; zu zeigen, wie fähig ich bin. | To be ambitious; to show how capable I am. |
| Im Leben vorwärtszukommen; danach zu streben, besser zu sein als andere. | To get ahead in life; to strive to be better than others. |
| *Power* |  |
| Reich zu sein; viel Geld und teure Sachen zu besitzen. | To be rich; to have a lot of money and expensive things. |
| Die Führung zu übernehmen und anderen zu sagen, was sie tun sollen; andere dazu zu bewegen zu tun, was ich sage. | Taking the lead and telling others what to do; getting others to do what I say. |
| Immer derjenige zu sein, der die Entscheidungen trifft; Führungspositionen zu übernehmen. | Always being the one who makes the decisions; taking leadership positions. |
|  |  |
| **Social norms** |  |
| Der Wahlkampf war in hohem Maß von gegenseitigen Angriffen geprägt. | The election campaign was characterized to a large extent by mutual attacks. |
|  |  |
| **Descriptive norms (alternative social norms measure for subset)** |  |
| Die meisten Kandidierenden meiner Partei nutzen Angriffe auf den politischen Gegner im Wahlkampf.  | Most candidates of my party use attacks on political opponents in election campaigns.  |
| **Injunctive norms (alternative social norms measure for subset)** |  |
| Meine Wählerinnen und Wähler finden, dass Angriffe auf den politischen Gegner eine angemessene Strategie im Wahlkampf sind. | My voters find that attacks on political opponents are an appropriate strategy in election campaigns.  |
|  |  |
| **Attitudes** |  |
| Angriffe auf den politischen Gegner sind ein legitimes Mittel, um sich einen Vorteil im Wahlkampf zu verschaffen. | Attacks on the political opponent are a legitimate means of gaining an advantage in the election campaign. |
| Wenn Angriffe auf den politischen Gegner nur das Ziel haben, sich einen Vorteil zu verschaffen, ist das unfair. | If attacks on the political opponent have only the goal of gaining an advantage, that is unfair. |
| Angriffe auf den politischen Gegner sind gerechtfertigt, da man so die eigenen Wähler mobilisieren kann. | Attacks on the political opponent are justified because they can mobilize one's own voters. |
|  |  |
| **Political opponents’ perceived attack behavior** |  |
| Und wenn Sie jetzt einmal umgekehrt an Ihre politischen Gegner denken. Wie häufig wurden Sie vom politischen Gegner angegriffen?  | And if you now think about your political opponents the other way around. How often have you been attacked by your political opponents? |

Table A2: Descriptive measures of the dependent and independent variables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | mean | SD | median | min | max |
| attack | 2.69 | 1.01 | 3.00 | 1.00 | 5.00 |
| rational choice (benefits-costs) | -0.30 | 1.63 | 0.00 | -4.00 | 4.00 |
| benefits | 2.68 | 1.06 | 3.00 | 1.00 | 5.00 |
| costs | 2.98 | 0.97 | 3.00 | 1.00 | 5.00 |
| retaliation | 2.78 | 1.21 | 3.00 | 1.00 | 5.00 |
| honesty-humility | 4.10 | 0.59 | 4.25 | 1.00 | 5.00 |
| emotionality | 2.66 | 0.70 | 2.75 | 1.00 | 5.00 |
| extraversion | 4.26 | 0.67 | 4.33 | 1.00 | 5.00 |
| agreeableness | 3.26 | 0.60 | 3.25 | 1.00 | 5.00 |
| conscientiousness | 3.61 | 0.65 | 3.75 | 1.25 | 5.00 |
| openness | 3.78 | 0.64 | 3.75 | 1.00 | 5.00 |
| dark | 2.56 | 0.69 | 2.50 | 1.00 | 5.00 |
| achievement | 2.68 | 0.96 | 2.75 | 1.00 | 5.00 |
| power | 2.23 | 0.83 | 2.33 | 1.00 | 5.00 |
| social norms  | 2.73 | 1.23 | 3.00 | 1.00 | 5.00 |
| Attitude: legitimate | 3.01 | 1.11 | 3.00 | 1.00 | 5.00 |
| Attitude: unfair (reversed) | 2.55 | 1.25 | 2.00 | 1.00 | 5.00 |
| attitude: justified | 2.94 | 1.09 | 3.00 | 1.00 | 5.00 |
| ideology | 4.79 | 2.27 | 5.00 | 1.00 | 11.00 |
| extremism | 2.06 | 1.55 | 2.00 | 0.00 | 5.00 |

Note: N=2,328.

## Appendix B: Additional analyses

Table B1: Candidates running, successfully contacted candidates, participating candidates, and response rates by state and party

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Total | Baden-Wuerttem-berg | Rhineland-Palatinate | Saxony-Anhalt | Berlin | Mecklen-burg-Western Pomerania | Saarland | Schleswig-Holstein | North Rhine-Westphalia | Lower Saxony | Bremen | Bavaria | Hesse |
| Election date |  | 3/14/2021 | 3/14/2021 | 6/6/2021 | 9/26/2021 | 9/26/2021 | 3/27/2022 | 5/8/2022 | 5/15/2022 | 10/9/2022 | 5/14/2023 | 10/8/2023 | 10/8/2023 |
| *Candidates running*  |  |  |  |  |  |  |  |  |  |  |  |  |
| Total | 7532 | 830 | 821 | 437 | 1154 | 463 | 262 | 313 | 791 | 558 | 267 | 1121 | 515 |
|  CDU/CSU | 1202 | 70 | 103 | 58 | 127 | 41 | 110 | 76 | 152 | 128 | 63 | 164 | 110 |
|  SPD | 1125 | 70 | 129 | 41 | 109 | 42 | 52 | 48 | 129 | 101 | 73 | 170 | 161 |
|  FDP | 884 | 69 | 103 | 38 | 87 | 42 | 37 | 38 | 128 | 87 | 25 | 175 | 55 |
|  B90/Grüne | 927 | 70 | 80 | 46 | 93 | 45 | 27 | 56 | 135 | 88 | 45 | 180 | 62 |
|  Die Linke | 825 | 70 | 51 | 45 | 82 | 41 | 21 | 38 | 125 | 81 | 28 | 180 | 63 |
|  AfD | 695 | 65 | 54 | 50 | 80 | 43 | 15 | 35 | 122 | 73 | - | 94 | 64 |
|  Other parties | 1874 | 416 | 301 | 159 | 576 | 209 | - | 22b | - | - | 33c | 158d | - |
| *Successfully contacted candidates*  |  |  |  |  |  |  |  |  |  |  |  |
| Total | 7379 | 824 | 788 | 423 | 1116 | 434 | 257 | 311 | 789 | 546 | 267 | 1118 | 506 |
|  CDU/CSU | 1191 | 70 | 99 | 55 | 126 | 41 | 108 | 75 | 152 | 128 | 63 | 164 | 110 |
|  SPD | 1117 | 70 | 125 | 41 | 109 | 42 | 52 | 48 | 129 | 101 | 73 | 170 | 157 |
|  FDP | 872 | 69 | 98 | 36 | 86 | 41 | 36 | 38 | 128 | 87 | 25 | 174 | 54 |
|  B90/Grüne | 918 | 70 | 75 | 45 | 93 | 45 | 25 | 56 | 135 | 88 | 45 | 180 | 61 |
|  Die Linke | 816 | 70 | 48 | 45 | 82 | 41 | 21 | 38 | 123 | 79 | 28 | 179 | 62 |
|  AfD | 670 | 64 | 48 | 49 | 75 | 43 | 15 | 35 | 122 | 63 | - | 94 | 62 |
|  Other parties | 1795 | 411 | 295 | 152 | 545 | 181 | - | 21b | - | - | 33c | 157d | - |
|  *Participating candidates*  |  |  |  |  |  |  |  |  |  |  |  |
| Total | 3182 | 490 | 362 | 153 | 391 | 161 | 116 | 139 | 336 | 224 | 84 | 501 | 225 |
|  CDU/CSU | 473 | 31 | 60 | 24 | 35 | 10 | 43 | 26 | 54 | 55 | 17 | 70 | 48 |
|  SPD | 476 | 50 | 62 | 18 | 30 | 15 | 27 | 18 | 54 | 38 | 27 | 68 | 69 |
|  FDP | 407 | 40 | 46 | 15 | 43 | 22 | 23 | 19 | 47 | 37 | 8 | 81 | 26 |
|  B90/Grüne | 506 | 51 | 48 | 25 | 41 | 25 | 12 | 31 | 78 | 45 | 17 | 104 | 29 |
|  Die Linke | 370 | 46 | 23 | 22 | 37 | 16 | 6 | 23 | 60 | 28 | 12 | 64 | 33 |
|  AfD | 222 | 27 | 14 | 11 | 23 | 7 | 5 | 11 | 43 | 21 | - | 40 | 20 |
|  Other parties | 728 | 245 | 109 | 38 | 182 | 66 | - | 11b | - | - | 3c | 74d | - |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Total | Baden-Wuerttem-berg | Rhineland-Palatinate | Saxony-Anhalt | Berlin | Mecklen-burg-Western Pomerania | Saarland | Schleswig-Holstein | North Rhine-Westphalia | Lower Saxony | Bremen | Bavaria | Hesse |
| *Response ratea* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Total | 43.1 | 59.5 | 45.9 | 36.2 | 35.0 | 37.1 | 45.1 | 44.7 | 42.6 | 41.0 | 31.5 | 44.8 | 44.5 |
|  CDU/CSU | 39.7 | 44.3 | 60.6 | 43.6 | 27.8 | 24.4 | 39.8 | 34.7 | 35.5 | 43.0 | 27.0 | 42.7 | 43.6 |
|  SPD | 42.6 | 71.4 | 49.6 | 43.9 | 27.5 | 35.7 | 51.9 | 37.5 | 41.9 | 37.6 | 37.0 | 40.0 | 43.9 |
|  FDP | 46.7 | 58.0 | 46.9 | 41.7 | 50.0 | 53.7 | 63.9 | 50.0 | 36.7 | 42.5 | 32.0 | 46.6 | 48.1 |
|  B90/Grüne | 55.1 | 72.9 | 64.0 | 55.6 | 44.1 | 55.6 | 48.0 | 55.4 | 57.8 | 51.1 | 37.8 | 57.8 | 47.5 |
|  Die Linke | 45.3 | 65.7 | 47.9 | 48.9 | 45.1 | 39.0 | 28.6 | 60.5 | 48.8 | 35.4 | 42.9 | 35.8 | 53.2 |
|  AfD | 33.1 | 42.2 | 29.2 | 22.4 | 30.7 | 16.3 | 33.3 | 31.4 | 35.2 | 33.3 | - | 42.6 | 32.3 |
|  Other parties | 40.6 | 59.6 | 36.9 | 25.0 | 33.4 | 36.5 | - | 52.4b | - | - | 9.1c | 47.1d | - |

Note: a: Percent of participating candidates out of successfully contacted candidates, b: Südschleswigscher Wählerverband (SSW) only, c: Bürger in Wut (BIW) Bremen only, d: FREIE WÄHLER Bayern only

Table B2: Difference between participating and non-participating candidates by gender, age, government status, and party

|  |  |  |
| --- | --- | --- |
|  | Participants | Non-Participants |
| % male | 63.9 | 65.5 |
| Age (mean) | 45.7 | 46.0 |
| % running for governing party | 33.2 | 32.6 |
| Party |  |  |
|  % CDU/CSU | 14.9\*\*\* | 17.1 |
|  % SPD | 15.0 | 15.3 |
|  % FDP | 12.8 | 11.1 |
|  % B90/Grüne | 15.9 | 9.8 |
|  % Die Linke | 11.6 | 10.6 |
|  % AfD | 7.0 | 10.7 |
|  % other party | 22.9 | 25.4 |
| N | 3,182 | 4,197 |

Note: Data is based on information provided by the State Returning Officers (“Landeswahlleiter”). Non-participants are candidates who were invited to the study but did not participate. For 3 participants and 7 non-participants, information about their age was not available. CDU/CSU: Christlich Demokratische Union Deutschlands / Christlich-Soziale Union in Bayern, SPD: Sozialdemokratische Partei Deutschlands, FDP: Freie Demokratische Partei, B90/Grüne: Bündnis 90/Die Grünen, AfD: Alternative für Deutschland. Significance levels: \*\*\* *p*≤0.001, \*\* *p*≤0.01, \* *p*≤0.05

Table B3: Variance Inflation Factor (VIF)

|  |  |
| --- | --- |
|  | *VIF* |
| *Rational Choice* |  |
| Balance benefits - costs | 1.37 |
| Retaliation | 1.17 |
| *Personality* |  |
| Honesty-humility | 1.43 |
| Emotionality | 1.24 |
| Extraversion | 1.17 |
| Agreeableness | 1.24 |
| Conscientiousness | 1.14 |
| Openness | 1.13 |
| “Dark” personality | 1.60 |
| *Values* |  |
| Achievement | 1.97 |
| Power | 1.96 |
| *Social Norms* | 1.39 |
| *Attitudes* |  |
| Legitimate | 1.97 |
| Unfair (reversed) | 1.30 |
| Justified | 1.95 |
| *Control variables* |  |
| Gender | 1.25 |
| Incumbency | 1.07 |
| Governmental status | 1.20 |
| Ideology | 1.82 |
| Extremism | 1.73 |
| *State* | 1.66 |

Table B4: Determinants of candidates’ use of negative campaigning, benefit and cost considerations separated

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *b* | *SE* | *beta* | *p* | Min R2 |
| *Rational Choice* |  |  |  |  | .074\*\*\* |
| Benefit | .167 | .019 | .175 | < .001 |  |
| Cost | -.089 | .019 | -.086 | < .001 |  |
| Retaliation | .163 | .015 | .194 | < .001 |  |
| *Personality* |  |  |  |  | .007\*\*\* |
| Honesty-humility | -.032 | .035 | -.019 | .350 |  |
| Emotionality | .014 | .027 | .010 | .591 |  |
| Extraversion | .039 | .028 | .026 | .154 |  |
| Agreeableness | -.114 | .032 | -.068 | < .001 |  |
| Conscientiousness | .007 | .028 | .004 | .813 |  |
| Openness | .068 | .028 | .042 | .017 |  |
| “Dark” personality | .059 | .031 | .040 | .059 |  |
| *Values* |  |  |  |  | .003\*\*\* |
| Achievement | -.065 | .025 | -.062 | .008 |  |
| Power | -.020 | .029 | -.017 | .480 |  |
| *Social Norms* | .037 | .016 | .045 | .021 | .001\* |
| *Attitudes* |  |  |  |  | .044\*\*\* |
| Legitimate | .138 | .021 | .152 | < .001 |  |
| Unfair (reverse) | .046 | .016 | .056 | .003 |  |
| Justified | .097 | .022 | .104 | < .001 |  |
| *Control variables* |  |  |  |  | .034\*\*\* |
| Gender | -.029 | .010 | -.054 | .004 |  |
| Incumbency | .020 | .015 | .022 | .199 |  |
| Governmental status | -.080 | .010 | -.147 | < .001 |  |
| Ideology | .027 | .010 | .061 | .007 |  |
| Extremism | .064 | .014 | .098 | < .001 |  |
| *State (*Schleswig-Holstein *=0)* |  |  |  |  |  |
| Bremen | .028 | .033 | .017 | .410 |  |
| Lower Saxony | -.009 | .025 | -.009 | .723 |  |
| North Rhine-Westphalia | -.027 | .023 | -.034 | .238 |  |
| Hesse | .056 | .026 | .055 | .032 |  |
| Rhineland-Palatinate | -.020 | .023 | -.026 | .383 |  |
| Baden-Wuerttemberg | -.004 | .022 | -.005 | .870 |  |
| Bavaria | .020 | .024 | .028 | .395 |  |
| Saarland | -.038 | .030 | -.028 | .206 |  |
| Berlin | -.009 | .024 | -.011 | .706 |  |
| Mecklenburg-Western Pomerania | -.028 | .027 | -.025 | .304 |  |
| Saxony-Anhalt | -.025 | .028 | -.021 | .364 |  |

Note: N=2,296 candidates who ran in German state elections. All independent variables were set to a range between 0 and 1. Minimum R2 of each set of predictors is determined by including them in the model after the effects of all other variables have been taken into account. An F-test was used to determine whether the increase in R2 is significant. Full model: *F*(32, 2295) = 39.97, p<.001, *R*²adj=.349. Significance levels: \*\*\* *p*≤0.001, \*\* *p*≤0.01, \* *p*≤0.05

Table B5: Determinants of candidates’ use of negative campaigning across twelve German state elections, controlling for party

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *b* | *SE* | *beta* | *p* | Min R2 |
| *Rational Choice* |  |  |  |  | .062\*\*\* |
| Balance benefits - costs  | .122 | .012 | .196 | < .001 |  |
| Retaliation | .163 | .016 | .194 | < .001 |  |
| *Personality* |  |  |  |  | .008\*\*\* |
| Honesty-humility | -.052 | .034 | -.030 | .135 |  |
| Emotionality | .014 | .027 | .009 | .609 |  |
| Extraversion | .046 | .027 | .030 | .093 |  |
| Agreeableness | -.115 | .031 | -.068 | < .001 |  |
| Conscientiousness | .001 | .028 | .001 | .961 |  |
| Openness | .071 | .028 | .044 | .012 |  |
| “Dark” personality | .048 | .031 | .033 | .123 |  |
| *Values* |  |  |  |  | .001\* |
| Achievement | -.054 | .025 | -.051 | .029 |  |
| Power | .003 | .029 | .003 | .912 |  |
| *Social Norms* | .034 | .016 | .042 | .034 | .001\* |
| *Attitudes* |  |  |  |  | .044\*\*\* |
| Legitimate | .137 | .021 | .151 | < .001 |  |
| Unfair (reverse) | .047 | .015 | .058 | .003 |  |
| Justified | .100 | .022 | .107 | < .001 |  |
| *Control variables* |  |  |  |  | .045\*\*\* |
| Gender | -.025 | .010 | -.048 | .011 |  |
| Incumbency | .028 | .015 | .032 | .070 |  |
| Governmental status | -.061 | .011 | -.111 | < .001 |  |
| Ideology | .003 | .014 | .006 | .853 |  |
| Extremism | .038 | .016 | .058 | .015 |  |
| *State (*Schleswig-Holstein *=0)* |  |  |  |  |  |
| Bremen | .039 | .033 | .024 | .241 |  |
| Lower Saxony | -.001 | .025 | -.001 | .981 |  |
| North Rhine-Westphalia | -.019 | .023 | -.023 | .411 |  |
| Hesse | .066 | .026 | .064 | .012 |  |
| Rhineland-Palatinate | -.019 | .023 | -.024 | .405 |  |
| Baden-Wuerttemberg | -.007 | .023 | -.010 | .772 |  |
| Bavaria | .030 | .023 | .042 | .209 |  |
| Saarland | -.028 | .030 | -.020 | .349 |  |
| Berlin | -.015 | .024 | -.019 | .533 |  |
| Mecklenburg-Western Pomerania | -.027 | .027 | -.023 | .324 |  |
| Saxony-Anhalt | -.030 | .027 | -.026 | .268 |  |
|  |  |  |  |  |  |
| *Party (*CDU/CSU *=0)* |  |  |  |  |  |
| SPD | -.039 | .019 | -.054 | .043 |  |
| AfD | .067 | .023 | .068 | .004 |  |
| FDP | -.026 | .018 | -.034 | .149 |  |
| Die Linke | .037 | .024 | .047 | .118 |  |
| B90/Die Grünen | -.032 | .019 | -.047 | .087 |  |
| Other party | .025 | .019 | .042 | .187 |  |

Note: N=2,293 candidates who ran in German state elections. All independent variables were set to a range between 0 and 1. Minimum R2 of each set of predictors is determined by including them in the model after the effects of all other variables have been taken into account. An F-test was used to determine whether the increase in R2 is significant. Full model: *F*(37, 2293) = 36.05, p<.001, *R*²adj=.357. Significance levels: \*\*\* *p*≤0.001, \*\* *p*≤0.01, \* *p*≤0.05

Table B6: Determinants of candidates’ use of negative campaigning across four German state elections, including injunctive norms

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *b* | *SE* | *beta* | *p* | Min R2 |
| *Rational Choice* |  |  |  |  | .041\*\*\* |
| Balance benefits - cost | .061 | .022 | .101 | .006 |  |
| Retaliation | .155 | .026 | .186 | < .001 |  |
| *Personality* |  |  |  |  | .000 |
| Honesty-humility | -.017 | .064 | -.009 | .797 |  |
| Emotionality | .025 | .048 | .017 | .611 |  |
| Extraversion | .017 | .049 | .011 | .734 |  |
| Agreeableness | -.032 | .059 | -.018 | .583 |  |
| Conscientiousness | -.080 | .048 | -.053 | .097 |  |
| Openness | .034 | .050 | .022 | .495 |  |
| “Dark” personality | .060 | .057 | .040 | .291 |  |
| *Values* |  |  |  |  | .001 |
| Achievement | -.042 | .044 | -.041 | .330 |  |
| Power | -.040 | .049 | -.033 | .422 |  |
| *Social Norms* |  |  |  |  | .019\*\*\* |
| Descriptive norms (own party) | .075 | .032 | .082 | .021 |  |
| Injunctive norms (voters) | .123 | .038 | .129 | .001 |  |
| *Attitudes* |  |  |  |  | .031\*\*\* |
| Legitimate | .204 | .041 | .222 | < .001 |  |
| Unfair (reverse) | -.006 | .029 | -.007 | .834 |  |
| Justified | .030 | .042 | .031 | .474 |  |
| *Control variables* |  |  |  |  | .043\*\*\* |
| Gender | -.027 | .017 | -.052 | .114 |  |
| Incumbency | .055 | .025 | .068 | .027 |  |
| Governmental status | -.083 | .018 | -.157 | < .001 |  |
| Ideology | .013 | .016 | .030 | .435 |  |
| Extremism | .056 | .025 | .085 | .026 |  |
| *State (*Bremen *=0)* |  |  |  |  |  |
| Lower Saxony | -.034 | .032 | -.057 | .280 |  |
| Hesse | .046 | .032 | .075 | .153 |  |
| Bavaria | .014 | .030 | .027 | .656 |  |

Note: N=718 candidates who ran in German state elections. All independent variables were set to a range between 0 and 1. Minimum R2 of each set of predictors is determined by including them in the model after the effects of all other variables have been taken into account. An F-test was used to determine whether the increase in R2 is significant. Full model: *F*(24, 693) = 18.93, p<.001, *R*²adj=.375. Significance levels: \*\*\* *p*≤0.001, \*\* *p*≤0.01, \* *p*≤0.05

Table B7: Logistic regression of candidates’ use of negative campaigning across twelve German state elections, binary dependent variable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | *b* | *SE* | *OR*  | *p* | *CI* | *Rmin* |
|  |  |  |  |  | *Lower* | *Upper* |  |
| *Rational Choice* |  |  |  |  |  |  | .112\*\*\* |
| Balance benefits - cost | .229 | .054 | 1.257 | < .001 | 1.131 | 1.399 |  |
| Retaliation | .794 | .079 | 2.213 | < .001 | 1.902 | 2.592 |  |
| *Personality* |  |  |  |  |  |  | .002 |
| Honesty-humility | .067 | .161 | 1.070 | .676 | .779 | 1.464 |  |
| Emotionality | .077 | .120 | 1.080 | .522 | .853 | 1.368 |  |
| Extraversion | -.052 | .126 | .949 | .681 | .739 | 1.214 |  |
| Agreeableness | -.045 | .147 | .956 | .761 | .716 | 1.274 |  |
| Conscientiousness | -.063 | .126 | .939 | .618 | .732 | 1.202 |  |
| Openness | .091 | .130 | 1.095 | .484 | .848 | 1.412 |  |
| “Dark” personality | .063 | .141 | 1.065 | .653 | .809 | 1.406 |  |
| *Values* |  |  |  |  |  |  | .002 |
| Achievement | -.185 | .113 | .831 | .104 | .666 | 1.039 |  |
| Power | .123 | .131 | 1.131 | .348 | .875 | 1.463 |  |
| *Social Norms* | -.080 | .073 | .923 | .268 | .800 | 1.064 | .001 |
| *Attitudes* |  |  |  |  |  |  | .065\*\*\* |
| Legitimate | .394 | .099 | 1.483 | < .001 | 1.224 | 1.802 |  |
| Unfair (reverse) | .147 | .073 | 1.159 | .043 | 1.006 | 1.338 |  |
| Justified | .423 | .101 | 1.527 | < .001 | 1.254 | 1.864 |  |
| *Control variables* |  |  |  |  |  |  | .034\*\* |
| Gender | -.328 | .172 | .720 | .056 | .515 | 1.009 |  |
| Incumbency | .789 | .382 | 2.202 | .039 | 1.097 | 4.965 |  |
| Governmental status | -.428 | .175 | .652 | .014 | .463 | .918 |  |
| Ideology | -.003 | .057 | .997 | .965 | .895 | 1.121 |  |
| Extremism | .142 | .074 | 1.153 | .054 | 1.000 | 1.337 |  |
| *State (*Schleswig-Holstein *=0)* |  |  |  |  |  |  |  |
| Bremen | .566 | .688 | 1.761 | .411 | .483 | 7.551 |  |
| Lower Saxony | .305 | .483 | 1.356 | .529 | .513 | 3.461 |  |
| North Rhine-Westphalia | .451 | .464 | 1.569 | .331 | .614 | 3.830 |  |
| Hesse | 1.006 | .603 | 2.735 | .095 | .858 | 9.400 |  |
| Rhineland-Palatinate | -.229 | .425 | .795 | .589 | .331 | 1.772 |  |
| Baden-Wuerttemberg | .241 | .439 | 1.273 | .582 | .517 | 2.927 |  |
| Bavaria | .481 | .456 | 1.617 | .292 | .639 | 3.869 |  |
| Saarland | -.425 | .495 | .654 | .391 | .242 | 1.705 |  |
| Berlin | -.264 | .442 | .768 | .551 | .310 | 1.778 |  |
| Mecklenburg-Western Pomerania | .166 | .504 | 1.181 | .742 | .431 | 3.148 |  |
| Saxony-Anhalt | -.004 | .496 | .996 | .994 | .368 | 2.608 |  |

Note: N=2,328 candidates who ran in German state elections. Dependent variable: binary variable with 0 (“no use of negative campaigning”) and 1 (“use of negative campaigning”). All independent variables were set to a range between 0 and 1. Minimum R2 of each set of predictors is determined by including them in the model after the effects of all other variables have been taken into account. An F-test was used to determine whether the increase in R2 is significant. Full model: Nagelkerke *R*²=.348. Significance levels: \*\*\* *p*≤0.001, \*\* *p*≤0.01, \* *p*≤0.05

Table B8: Determinants of candidates’ use of negative campaigning across twelve German state elections, joint calculation of the incremental R2 of the “psychological” variables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *b* | *SE* | *beta* | *p* | Min R2 |
| *Rational Choice* |  |  |  |  | .072\*\*\* |
| Balance benefits - costs | .129 | .012 | .207 | < .001 |  |
| Retaliation | .168 | .015 | .199 | < .001 |  |
| *Psychological factors* |  |  |  |  | .066\*\*\* |
| *(Personality)* |  |  |  |  |  |
| Honesty-humility | -.036 | .035 | -.021 | .297 |  |
| Emotionality | .018 | .027 | .012 | .513 |  |
| Extraversion | .038 | .028 | .025 | .168 |  |
| Agreeableness | -.113 | .032 | -.067 | < .001 |  |
| Conscientiousness | .006 | .028 | .004 | .835 |  |
| Openness | .071 | .028 | .044 | .013 |  |
| “Dark” personality | .064 | .031 | .043 | .042 |  |
| *(Values)* |  |  |  |  |  |
| Achievement | -.061 | .025 | -.058 | .013 |  |
| Power | -.020 | .029 | -.016 | .491 |  |
| *(Social Norms)* | .039 | .016 | .047 | .017 |  |
| *(Attitudes)* |  |  |  |  |  |
| Legitimate | .140 | .021 | .154 | < .001 |  |
| Unfair (reverse) | .046 | .016 | .057 | .003 |  |
| Justified | .098 | .022 | .105 | < .001 |  |
| *Control variables* |  |  |  |  | .034\*\*\* |
| Gender | -.030 | .010 | -.057 | .002 |  |
| Incumbency | .019 | .015 | .022 | .208 |  |
| Governmental status | -.079 | .010 | -.144 | < .001 |  |
| Ideology | .026 | .010 | .058 | .011 |  |
| Extremism | .063 | .014 | .097 | < .001 |  |
| *State (*Schleswig-Holstein *=0)* |  |  |  |  |  |
| Bremen | .030 | .033 | .018 | .370 |  |
| Lower Saxony | -.006 | .025 | -.006 | .805 |  |
| North Rhine-Westphalia | -.026 | .023 | -.031 | .273 |  |
| Hesse | .058 | .026 | .056 | .027 |  |
| Rhineland-Palatinate | -.019 | .023 | -.024 | .423 |  |
| Baden-Wuerttemberg | -.002 | .022 | -.002 | .944 |  |
| Bavaria | .022 | .024 | .031 | .347 |  |
| Saarland | -.040 | .030 | -.029 | .188 |  |
| Berlin | -.008 | .024 | -.010 | .735 |  |
| Mecklenburg-Western Pomerania | -.027 | .027 | -.024 | .325 |  |
| Saxony-Anhalt | -.024 | .028 | -.021 | .377 |  |

Note: N=2,296 candidates who ran in German state elections. All independent variables were set to a range between 0 and 1. Last column: Minimum R2 of each set of predictors is determined by including them in the model after the effects of all other variables have been taken into account. An F-test was used to determine whether the increase in R2 is significant. Full model: *F*(31, 2296) = 40.91, p<.001, *R*²adj=.347. Significance levels: \*\*\* *p*≤0.001, \*\* *p*≤0.01, \* *p*≤0.05

**Appendix C: Validation of the dependent variable**

Figure C1: Correlation between candidates’ self-reported use of negative campaigning (aggregated by election and party) and expert ratings of parties’ negative campaigning



Candidate self-reports: scale from 1 (“never attacked the political opponent”) to 5 (“very often attacked the political opponent”). Expert ratings: “When considering the electoral campaigns of the following actors during the most recent state election, would you say that their campaign was exclusively negative, exclusively positive or somewhere in between? Please provide a score between -10 (‘exclusively negative’) and 10 (‘exclusively positive’)”. Expert data is available for 8 of the 12 elections, with participation of N=8 experts for Baden-Württemberg, N=17 experts for Bavaria, N=4 experts for Berlin, N=4 experts for Lower Saxony, N=3 experts for Mecklenburg Western-Pomerania, N=12 experts for North Rhine-Westphalia. N=11 experts for Rhineland-Palatine, and N=7 experts for Saxony-Anhalt.

Figure C2: Correlation between candidates’ self-reported use of negative campaigning and the share of candidates’ use of negative campaigning on social media (aggregated by election and party)

Candidate self-reports: scale from 1 (“never attacked the political opponent”) to 5 (“very often attacked the political opponent”). Social media: Candidates were informed in the informed consent stage before the candidate survey that the project will link their survey responses to their social media posts on Facebook and Twitter that were collected by the project. 44,000 posts were coded by a team of five trained student assistants for the presence of attacks, with an interrater agreement of Krippendorff’s alpha=.88. Based on the coded social media posts, we built a machine learning model using word embeddings that was able to classify all social media posts by candidates on both platforms as containing an attack or not with an F1 score of .685 (OMITTED). Self-reports and observed NC on social media could be matched for N=1,350 candidates who participated in the survey and who published at least one post on social media in the last three months prior to each election. To reduce noise, the share of attacks among all posts is shown for N=1,251 candidates who published at least five posts during the research period. The analysis includes all 12 elections covered in this article.

Figure C3: Correlation between candidates’ self-reported use of negative campaigning and the share of candidates’ use of negative campaigning on social media on the individual-level of candidates



Candidate self-reports of negative campaigning vs. share of social media posts containing an attack. N=1,455 candidates who published at least five posts during the research period.