**Online Appendix – Genes, Ideology, and Sophistication**

**Table A1: Summary Statistics by Knowledge Levels**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **High Knowledge:**  **Both Twins (21%)** | | | **Mid-Knowledge:**  **One Twin (32%)** | | | **Low Knowledge:**  **Neither Twin (47%)** | | |
|  | *mean* | *s.d.* | *N*  *pairs* | *mean* | *s.d.* | *N*  *pairs* | *mean* | *s.d.* | *N*  *pairs* |
| W-P Index | T1=-.03  T2=-.03 | T1=.36  T2=.34 | 121 | T1=.09  T2=.11 | T1=.31  T2=.29 | 183 | T1=.11  T2=.12 | T1=.21  T2=.21 | 271 |
| Ideology ID | T1=-.04  T2=-.04 | T1=.57  T2=.54 | 121 | T1=.17  T2=.15 | T1=.52  T2=.49 | 183 | T1=.10  T2=.10 | T1=.42  T2=.42 | 271 |
| W-P  Constraint | T1=.30  T2=.29 | T1=.21  T2=.18 | 121 | T1=.27  T2=.26 | T1=.18  T2=.17 | 183 | T1=.18  T2=.19 | T1=.15  T2=.15 | 271 |

Note: each cell reports statistics for twin 1 (T1) and twin 2 (T2).

**Table A2: Variance Components & Confidence Intervals**

**3-Part Political Knowledge Split – All 5 Correct (Both, One, Neither)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **All Twin Pairs** | | | **High Knowledge:**  **Both Twins (21%)** | | | **Mid-Knowledge:**  **One Twin (32%)** | | | **Low Knowledge:**  **Neither Twin (47%)** | | |
|  | a2 | c2 | e2 | a2 | c2 | e2 | a2 | c2 | e2 | a2 | c2 | e2 |
| W-P Index | Est  .047  Low  .029  High  .059 | Est  .004  Low  .000  High  .020 | Est  .028  Low  .024  High  .032 | Est  .093  **Low**  **.049**  High  .125 | Est  .000  Low  .000  High  .042 | Est  .032  Low  .024  High  .045 | Est  .052  Low  .016  High  .070 | Est  .000  Low  .000  High  .032 | Est  .038  Low  .030  High  .051 | Est  .014  Low  .000  **High**  **.030** | Est  .012  Low  .000  High  .025 | Est  .018  Low  .015  High  .023 |
| Ideology ID | Est  .118  Low  .071  High  .143 | Est  .000  Low  .000  High  .040 | Est  .116  Low  .101  High  .134 | Est  .187  **Low**  **.044**  High  .279 | Est  .017  Low  .000  High  .156 | Est  .101  Low  .075  High  .140 | Est  .126  Low  .023  High  .176 | Est  .000  Low  .000  High  .087 | Est  .134  Low  .104  High  .174 | Est  .059  Low  .003  **High**  **.087** | Est  .000  Low  .000  High  .044 | Est  .118  Low  .097  High  .145 |
| W-P  Constraint | Est  .009  Low  .001  High  .017 | Est  .005  Low  .000  High  .012 | Est  .016  Low  .014  High  .019 | Est  .018  **Low**  **.000**  High  .028 | Est  .001  Low  .000  High  .021 | Est  .020  Low  .015  High  .028 | Est  .009  Low  .000  High  .015 | Est  .000  Low  .000  High  .010 | Est  .021  Low  .016  High  .027 | Est  .004  Low  .000  **High**  **.013** | Est  .007  Low  .000  High  .013 | Est  .012  Low  .009  High  .014 |

Note: Variance component point estimate with 95% upper & lower bounds.

**Median Political Knowledge Split – Both Twins get 4+ Correct**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **All Twin Pairs** | | | **High Knowledge:**  **Both Twins (45%)** | | | **Low Knowledge:**  **< Both Twins (55%)** | | |
|  | a2 | c2 | e2 | a2 | c2 | e2 | a2 | c2 | e2 |
| W-P Index | Est  .047  Low  .029  High  .059 | Est  .004  Low  .000  High  .020 | Est  .028  Low  .024  High  .032 | Est  .079  **Low**  **.048**  High  .099 | Est  .000  Low  .000  High  .028 | Est  .035  Low  .028  High  .044 | Est  .025  Low  .010  **High**  **.038** | Est  .005  Low  .000  High  .019 | Est  .022  Low  .018  High  .027 |
| Ideology ID | Est  .118  Low  .071  High  .143 | Est  .000  Low  .000  High  .040 | Est  .116  Low  .101  High  .134 | Est  .155  **Low**  **.045**  High  .228 | Est  .025  Low  .000  High  .128 | Est  .114  Low  .092  High  .144 | Est  .071  Low  .026  **High**  **.099** | Est  .000  Low  .000  High  .034 | Est  .124  Low  .103  High  .149 |
| W-P  Constraint | Est  .009  Low  .001  High  .017 | Est  .005  Low  .000  High  .012 | Est  .016  Low  .014  High  .019 | Est  .014  **Low**  **.000**  High  .021 | Est  .001  Low  .000  High  .015 | Est  .019  Low  .015  High  .024 | Est  .008  Low  .000  **High**  **.015** | Est  .003  Low  .000  High  .011 | Est  .014  Low  .012  High  .017 |

**Table A3: Simple Method of Calculating Heritability: 2\*(MZ-DZ)**

**3-Part Political Knowledge Split – All 5 Correct (Both, One, Neither)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **All Twin Pairs** | | | **High Knowledge:**  **Both Twins (21%)** | | | **Mid-Knowledge:**  **One Twin (32%)** | | | **Low Knowledge:**  **Neither Twin (47%)** | | |
|  | MZ | DZ | **H** | MZ | DZ | **H** | MZ | DZ | **H** | MZ | DZ | **H** |
| W-P Index | .651  (.03) | .362  (.04) | **58%** | .739  (.03) | .338  (.04) | **80%** | .557  (.03) | .296  (.04) | **52%** | .575  (.03) | .453  (.04) | **24%** |
| W-P Item  Avg. | .393 | .203 | **38%** | .511 | .212 | **60%** | .367 | .177 | **38%** | .311 | .201 | **22%** |
| Ideology ID | .546  (.04) | .251  (.07) | **59%** | .696  (.06) | .456  (.15) | **48%** | .543  (.08) | .239  (.12) | **61%** | .349  (.09) | .149  (.11) | **40%** |
| W-P  Constraint | .472  (.04) | .316  (.04) | **31%** | .487  (.04) | .310  (.04) | **35%** | .312  (.04) | .126  (.04) | **37%** | .494  (.04) | .385  (.04) | **22%** |
| *N* twin pairs | 348 | 228 |  | 81 | 40 |  | 101 | 83 |  | 166 | 105 |  |

**Median Political Knowledge Split – Both Twins get 4+ Correct**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **High Knowledge:**  **Both Twins (45%)** | | | **Low Knowledge:**  **< Both Twins (55%)** | | |
|  | MZ | DZ | **H** | MZ | DZ | **H** |
| W-P Index | .694  (.03) | .328  (.04) | **73%** | .532  (.03) | .346  (.04) | **37%** |
| W-P Item Avg. | .475 | .193 | **56%** | .287 | .189 | **20%** |
| Ideology ID | .646  (.05) | .341  (.11) | **61%** | .394  (.07) | .159  (.10) | **47%** |
| W-P Constraint | .474  (.04) | .308  (.04) | **33%** | .419  (.04) | .291  (.04) | **26%** |
| *N* twin pairs | 166 | 96 |  | 185 | 132 |  |

*Note*: MZ = monozygotic twin pair polychoric correlation (rho), DZ = dizygotic twin pair polychoric correlation (rho), standard errors in parentheses. H = heritability estimate = 2\*(MZ-DZ).

Table A3 presents polychoric correlations and basic heritability estimates for all twin pairs and for subgroups by knowledge. The H column estimates the variance attributable to genes, which is calculated as twice the difference between MZ and DZ correlations. Overall heritability estimates for the full sample (left column) are similar to past reports: the W-P index is substantially heritable (58%), and an average of individual items shows somewhat lower heritability (38%). Ideological identification heritability (59%) is close to what Hatemi and colleagues (2014) find with SEM models. W-P ideological constraint is similar to Arceneaux and colleagues (2012), though our operationalization differs by incorporating attitude strength.

Our main focus is on tests stratified by twin pair political knowledge, particularly for the W-P index and items. We present these two ways: three knowledge groups, then a median split. As predicted, heritability estimates for ideology are highly dependent on information levels. When both twins correctly answer all questions (top 21%), heritability for the W-P index leaps to 80%. When neither twin aces the quiz (bottom 47%), heritability falls to just 24%. The most knowledgeable fraction of the public has heritability over three times higher than the least-sophisticated half on the W-P index. Strata contrasts with the median split are somewhat smaller due to the doubled size of the “top” group, but the sophisticated half still has heritability estimates twice as large as the less sophisticated half (e.g., W-P Hhigh=73%, Hlow=37%).

The average heritability for individual W-P items (see below) shows similar gaps by knowledge. The tripartite estimates attribute 60% of variance in the top group to genes and just 20% in the bottom half, with 38% in between. Although the 40 percentage-point heritability gap here resembles the W-P index, the item average has lower levels of heritability in each knowledge category due to noise from measurement error and non-attitudes (e.g., Ansolabehere et al. 2008).[[1]](#footnote-1)

**Table A4: Political Interest as Moderator**

**Three Interest Groups**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **All Twin Pairs** | | | **High Interest:**  **Both Twins (13%)** | | | **Mid-Interest:**  **One Twin (28%)** | | | **Low Interest:**  **Neither Twin (60%)** | | |
|  | MZ | DZ | **H** | MZ | DZ | **H** | MZ | DZ | **H** | MZ | DZ | **H** |
| W-P Index | .651  (.03) | .362  (.04) | **58%** | .868  (.02) | .438  (.04) | **86%** | .464  (.04) | .259  (.04) | **41%** | .596  (.03) | .418  (.04) | **36%** |
| Ideology ID | .546  (.04) | .251  (.07) | **59%** | .747  (.08) | .352  (.20) | **79%** | .486  (.08) | .066  (.14) | **84%** | .445  (.07) | .304  (.09) | **28%** |
| W-P  Constraint | .472  (.04) | .316  (.04) | **31%** | .704  (.03) | .377  (.04) | **65%** | .246  (.04) | .145  (.04) | **20%** | .442  (.04) | .383  (.04) | **12%** |

**Two Interest Groups**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **High Interest:**  **At Least One**  **Twin (40%)** | | | **Low Interest:**  **Neither Twin (60%)** | | |
|  | MZ | DZ | **H** | MZ | DZ | **H** |
| W-P Index | .691  (.03) | .316  (.04) | **75%** | .596  (.03) | .418  (.04) | **36%** |
| Ideology ID | .642  (.05) | .200  (.12) | **88%** | .445  (.07) | .304  (.09) | **28%** |
| W-P Constraint | .494  (.04) | .209  (.04) | **57%** | .442  (.04) | .383  (.04) | **12%** |

*Note*: MZ = monozygotic twin pair polychoric correlation (rho), DZ = dizygotic twin pair polychoric correlation (rho), standard errors in parentheses. H = heritability estimate = 2\*(MZ-DZ).

**Table A5: Genetic Influences on Wilson-Patterson Items, by Knowledge**

**3 Knowledge Categories (Simple calculation)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **All Twin Pairs** | | | **High Knowledge:**  **Both Twins (21%)** | | | **Mid-Knowledge:**  **One Twin (32%)** | | | **Low Knowledge:**  **Neither Twin (47%)** | | |
|  | MZ  *ρ* | DZ *ρ* | **H** | MZ  *ρ* | DZ  *ρ* | **H** | MZ  *ρ* | DZ  *ρ* | **H** | MZ  *ρ* | DZ  *ρ* | **H** |
| **Item Avg.** | **.39** | **.20** | **38%** | **.51** | **.21** | **60%** | **.37** | **.18** | **38%** | **.31** | **.20** | **22%** |
| Pacifists | .38 | .11 | **54** | .59 | .18 | **82** | .46 | .08 | **76** | .17 | .11 | **12** |
| Global | .29 | .13 | **32** | .41 | .12 | **58** | .21 | .24 | **-6** | .25 | .10 | **30** |
| Socialism | .30 | .18 | **24** | .55 | -.15 | **140** | .24 | .13 | **22** | .19 | .34 | **-30** |
| Porn | .35 | .31 | **8** | .55 | .10 | **90** | .38 | .15 | **46** | .24 | .47 | **-46** |
| Women’s  Liberation | .41 | -.02 | **86** | .40 | .06 | **68** | .51 | -.20 | **142** | .31 | .09 | **44** |
| Sex | .49 | .27 | **44** | .68 | .49 | **38** | .54 | .32 | **44** | .39 | .14 | **50** |
| Gay | .49 | .35 | **28** | .68 | .31 | **74** | .43 | .37 | **12** | .42 | .35 | **14** |
| Welfare | .35 | .06 | **58** | .55 | .11 | **88** | .21 | .09 | **24** | .31 | .00 | **62** |
| Stem Cells | .45 | .25 | **40** | .53 | .30 | **46** | .47 | .28 | **38** | .41 | .18 | **46** |
| Abortion | .48 | .33 | **30** | .53 | .22 | **62** | .36 | .34 | **4** | .52 | .36 | **32** |
| Evolution | .48 | .33 | **30** | .60 | .18 | **84** | .41 | .36 | **10** | .43 | .38 | **10** |
| Foreign Aid | .29 | .16 | **26** | .41 | .18 | **46** | .23 | -.01 | **48** | .23 | .30 | **-14** |
| Immig. | .28 | .17 | **22** | .32 | .20 | **24** | .15 | .20 | **-10** | .23 | .10 | **26** |
| Warrant | .32 | .15 | **34** | .36 | .17 | **38** | .30 | .11 | **38** | .30 | .16 | **28** |
| Guns | .45 | .37 | **16** | .61 | .47 | **28** | .42 | .24 | **36** | .33 | .42 | **-18** |
| Death Penalty | .43 | .21 | **44** | .61 | .28 | **66** | .45 | .13 | **64** | .30 | .18 | **24** |
| Patriotism | .37 | .09 | **56** | .47 | .06 | **82** | .22 | .10 | **24** | .37 | .06 | **62** |
| Bible | .58 | .42 | **32** | .70 | .53 | **34** | .54 | .35 | **38** | .42 | .34 | **16** |
| School Stand | .23 | -.06 | **58** | .16 | -.15 | **62** | .15 | -.19 | **68** | .26 | .08 | **36** |
| Tax | .37 | .22 | **30** | .32 | .20 | **24** | .37 | .34 | **6** | .24 | .05 | **38** |
| Abstinence | .37 | .24 | **26** | .52 | .23 | **58** | .26 | .20 | **12** | .29 | .26 | **6** |
| Torture | .38 | .23 | **30** | .51 | .34 | **34** | .50 | .23 | **54** | .25 | .21 | **8** |
| Prayer | .52 | .33 | **38** | .66 | .30 | **72** | .47 | .34 | **26** | .35 | .27 | **16** |
| Pollution | .36 | .02 | **68** | .40 | .18 | **44** | .35 | .03 | **64** | .35 | -.07 | **84** |
| Military | .38 | .25 | **26** | .62 | .19 | **86** | .42 | .28 | **28** | .24 | .25 | **-2** |
| Iraq | .45 | .21 | **48** | .58 | .36 | **44** | .45 | .07 | **76** | .38 | .25 | **26** |
| Small Gov’t | .35 | .16 | **38** | .47 | .29 | **36** | .41 | .22 | **38** | .21 | .04 | **34** |

*Note*: MZ = monozygotic twin pair polychoric correlation (rho), DZ = dizygotic twin pair polychoric correlation (rho). H = heritability estimate = 2\*(MZ-DZ).

**2 Knowledge Categories – 4 of 5 Correct**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **High Knowledge:**  **Both Twins (45%)** | | | **Low Knowledge:**  **Not Both (55%)** | | |
|  | MZ  *ρ* | DZ  *ρ* | **H** | MZ  *ρ* | DZ  *ρ* | **H** |
| **Item Avg.** | **.475** | **.193** | **56%** | **.287** | **.189** | **19%** |
| Pacifists | .58 | .21 | **74** | .13 | .03 | **20** |
| Global | .34 | .11 | **46** | .24 | .17 | **14** |
| Socialism | .41 | .05 | **72** | .18 | .26 | **-16** |
| Porn | .44 | .21 | **46** | .25 | .38 | **-26** |
| Women’s Liberation | .47 | -.09 | **112** | .37 | .05 | **64** |
| Sex | .62 | .30 | **64** | .39 | .25 | **28** |
| Gay | .63 | .31 | **64** | .31 | .36 | **-10** |
| Welfare | .40 | .03 | **74** | .26 | .06 | **40** |
| Stem Cells | .51 | .35 | **32** | .40 | .17 | **46** |
| Abortion | .49 | .27 | **44** | .47 | .36 | **22** |
| Evolution | .49 | .25 | **48** | .45 | .36 | **18** |
| Foreign Aid | .40 | .17 | **46** | .21 | .14 | **14** |
| Immig. | .27 | .35 | **-16** | .21 | -.01 | **44** |
| Warrant | .42 | .12 | **60** | .23 | .12 | **22** |
| Guns | .57 | .32 | **50** | .28 | .42 | **-28** |
| Death Penalty | .54 | .14 | **80** | .31 | .22 | **18** |
| Patriotism | .42 | .17 | **50** | .31 | .01 | **60** |
| Bible | .67 | .42 | **50** | .39 | .35 | **8** |
| School Stand | .28 | -.17 | **90** | .16 | .02 | **28** |
| Tax | .39 | .25 | **28** | .22 | .13 | **18** |
| Abstinence | .50 | .17 | **66** | .19 | .23 | **-8** |
| Torture | .49 | .21 | **56** | .30 | .25 | **10** |
| Prayer | .59 | .31 | **56** | .32 | .23 | **18** |
| Pollution | .41 | -.07 | **96** | .32 | .09 | **46** |
| Military | .52 | .28 | **48** | .25 | .22 | **6** |
| Iraq | .53 | .35 | **36** | .36 | .09 | **54** |
| Small Gov’t | .45 | .20 | **50** | .23 | .15 | **16** |

**Table A6: Genetic Influence on Ideological Orientations by Political Knowledge & by Sex (Simple calculation)**

**Female Pairs**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **All Twin Pairs** | | | **High & Mid-Knowledge** | | | **Low Knowledge** | | |
|  | MZ | DZ | **H** | MZ | DZ | **H** | MZ | DZ | **H** |
| W-P Index | .686  (.03) | .380  (.04) | **61%** | .720  (.03) | .353  (.04) | **74%** | .577  (.03) | .380  (.04) | **39%** |
| Ideology ID | .568  (.06) | .259  (.09) | **62%** | .670  (.06) | .295  (.14) | **74%** | .428  (.11) | .230  (.11) | **40%** |
| W-P Ideol. Constraint | .563  (.03) | .319  (.04) | **57%** | .519  (.04) | .228  (.04) | **58%** | .543  (.03) | .328  (.04) | **43%** |
| *N* | 209 | 145 |  | 89 | 67 |  | 120 | 81 |  |

*Note*: MZ = monozygotic twin pair correlation (rho), DZ = dizygotic twin pair correlation (rho), standard errors in parentheses. H = heritability estimate = 2\*(MZ-DZ). Cells for indices report Pearson correlations (standard errors in parentheses). Item estimates are polychoric correlations.

**Male Pairs**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **All Twin Pairs** | | | **High & Mid-Knowledge** | | | **Low Knowledge** | | |
|  | MZ | DZ | **H** | MZ | DZ | **H** | MZ | DZ | **H** |
| W-P Index | .602  (.03) | .333  (.04) | **54%** | .606  (.03) | .262  (.04) | **70%** | .574  (.03) | .684  (.03) | **--** |
| Ideology ID | .489  (.07) | .224  (.12) | **53%** | .579  (.07) | .320  (.13) | **56%** | .113  (.13) | -.093  (.21) | **42%** |
| W-P Ideol. Constraint | .328  (.04) | .331  (.04) | **--** | .299  (.04) | .196  (.04) | **46%** | .350  (.04) | .560  (.03) | **--** |
| *N* | 138 | 83 |  | 93 | 60 |  | 46 | 24 |  |

*Note*: MZ = monozygotic twin pair polychoric correlation (rho), DZ = dizygotic twin pair polychoric correlation (rho), standard errors in parentheses. H = heritability estimate = 2\*(MZ-DZ).

1. Heritability estimates can shrink when MZ correlations decline or when DZ correlations rise. For the W-P index, both changes seem to be at work: the MZ correlation is substantially higher for high-knowledge pairs than others, as is the low-knowledge DZ correlation. For W-P items, all DZ correlations are equally low while the MZ correlation rises in each category. These patterns are generally consistent with our expectations, apart from the high DZ correlation in the low group. [↑](#footnote-ref-1)