Cognitive Ability and Political Preferences in Denmark

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Abstract

Multiple studies have reported positive relationships between cognitive ability and preferences for freedom, both at the personal level (e.g. drug use) and the economic (e.g. smaller government). To add to this, we investigated the relationships between cognitive ability and multi-dimensional political preferences in a Danish general population sample ($n = 333$, $n = 259$ after quality control). Respondents answered 10 questions pertaining to specific personal issues, 10 questions pertaining to specific economic issues, as well as taking 4 cognitive items. They had previously taken a 5-item cognitive test (ICAR5), and been asked to rate themselves on personal liberalism and economic liberalism. We documented a general factor of personal liberalism across the questions on personal issues, and a general factor of economic liberalism across the questions on economic issues. Self-assessed personal liberalism had a small positive correlation with measured personal liberalism ($r = .13$), while self-assessed economic liberalism had a moderate positive correlation with measured economic liberalism ($r = .49$). These findings were in line with our predictions. Contrary to our predictions, however, personal liberalism and economic liberalism had a weak positive correlation ($r = .07$; 95 % CI = [–.06, .19]) and cognitive ability was only weakly related to both personal liberalism ($r = .14$; 95 % CI = .02, .26]) and economic liberalism ($r = .07$; 95 % CI = [–.05, .19]). Corrected for measurement error, the correlations were .23 and .10, respectively. The study was preregistered.

Keywords: cognitive ability, intelligence, IQ, political preferences, political dimensions, Denmark, open data, preregistered, social liberalism, social conservatism, economic liberalism,

1   Introduction

A widely used model of policy positions distinguishes between an economic axis on the one hand and a personal axis on the other (Carl, 2015b). The economic axis goes from economically statist or socialist at one end to economically liberal or capitalist at the other end, while the personal axis goes from liberal or progressive at one end to conservative or traditionalist at the other. For example, economically statist positions include nationalisation of industry, reduction of income inequality through redistribution, and more regulation over employment, while socially liberal positions include legalised abortion, free speech, and an end to prohibitions against drug use. Recent studies from Sweden, Denmark, and the United States indicate that cognitive ability has a positive relation to both socially liberal beliefs and at least some measures of economically liberal beliefs (Caplan & Miller, 2010; Carl, 2015a,b; Dawes et al., 2014; Mollerstrom

& Seim, 2014; Morton et al., 2011; Onraet et al., 2015; Solon, 2015). Cognitive ability appears to have a non-monotonic relation to measures of economically liberal beliefs pertaining to welfare for the indigent and affirmative action for minorities, at least in the United States (Carl, 2015a,b; Solon, 2014, 2015). The purpose of the present was to investigate the relationships between cognitive ability and multi-dimensional political preferences in a Danish sample.

2   Method

2.1   Data

Data were obtained from a recent Danish general population sample (n = 552), details of which have been reported elsewhere (Kirkegaard & Bjerrekær, 2016a). This sample was originally given a 5-item test of cognitive ability (Condon & Revelle, 2014; Kirkegaard & Bjerrekær, 2016b), and was asked numerous socio-economic and attitudinal questions, including self-assessed personal liberalism and self-assessed economic liberalism. Our sample comprises a subset

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of an original larger sample to whom our pollster administered a second questionnaire. The second questionnaire had 24 substantive items: 10 questions pertaining to specific personal issues, 10 questions pertaining to specific economic issues, and 4 extra cognitive items. Because not all persons invited to participate accepted, and some dropped out, the data we analyse constitutes only a subset of the original sample. The sample size was $n = 333$ (60 % of the original).

2.2 Additional items

The questions on personal issues required respondents to state their degree of agreement/disagreement with the following 10 statements (the order of statements was randomized across respondents):

1. A woman should have a legal right to an abortion if she wants one for any reason.

2. The government should punish people who utter racist opinions.

3. It should be legal to utter blasphemous opinions.

4. It should be legal to use, sell and manufacture cannabis and related products.

5. It should be prohibited to use, sell and manufacture LSD and related products.

6. It should be illegal to buy and sell sex.

7. Burning the Danish flag (Dannebrog) should be made a punishable offense.

8. It should be legal for adults to ride motorcycles without using a helmet.

9. It should be legal for adults to ride a car without using a seat belt.

10. The government should restrict citizens' access to pornography on the internet.

The questions on economic issues required respondents to state their degree of agreement/disagreement with the following 10 statements:

1. It's not the role of the government to make sure that everybody can get a job.

2. The government should mandate a higher minimum wage.

3. The government should not protect domestic industries from competition from other countries.

4. The government should mandate a maximum salary.

5. Taxes on income should be cut.

6. Taxes on property should be increased.

7. The government should keep regulations on business to a minimum.

8. The government should reduce income differences between the rich and the poor.

9. Large companies should be controlled by the state, not private actors.

10. The taxi law should be reformed such that there are fewer rules and companies like Uber become legal.

All questions were administered to the respondents in Danish. (For the Danish translations of each statement, please see the pre-study document.) Due to an internal disagreement over whether to use 1–7 Likert scales or 0–100 Likert scales for gauging agreement/disagreement, we decided to administer 1–7 scales to half the respondents at random and 0–100 scales to the other half. One of us (Carl) favored 1–7 scales on the grounds that these would be simpler, more familiar, and less cognitively onerous. Another one of us (Kirkegaard) favored 0–100 scales on the grounds that these would entail less violation of the continuity assumption of parametric statistics.

The 4 extra cognitive items were as follows. The first three, which comprise the Cognitive Reflection Test (CRT; (Frederick, 2005) items, require an integer response; the fourth, which is copied from (Pinker, 2012, Chapter 5), is a multiple choice question (the order of response categories was randomized across respondents):

1. A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?

2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

4. Suppose you live in a place that has a constant chance of being struck by lightning at any time throughout the year. Suppose that the strikes are random: every day the chance of a strike is the same, and the rate works out to one strike a month. Your house is hit by lightning today, Monday. What is the most likely day for the next bolt to strike your house?

a) Tuesday, the day after.

b) Wednesday, 2 days later.

c) Friday, 4 days later.

d) Monday, next week.

e) Monday, next month.

f) Tuesday, next month.

g) Every day has the same chance.

We pre-registered our study online, taking care to elucidate our analyses in advance, and to specify our predictions concerning what we might find (see the pre-study document).

2.3　Exclusions

In addition to the 24 additional substantive items, we added 3 control questions as a check on respondents giving random answers. These involved performing elementary tasks, such as correctly selecting the number 6 from among the numbers 1–7. About 20 % of respondents failed at least one of the control questions, which is quite a large number, given that the questionnaire was only sent out to those who had not failed control questions on the previous survey. All respondents who failed at least of one of the control questions were excluded from the analysis, consistent with the plan laid out in our pre-study document.

2.4　Representativeness

Because our sample was essentially a self-selected subset of another sample, it might be biased. As a check on representativeness, we calculated mean values of relevant variables for responders and non-responders from the original sample. As Table 1 indicates, responders were slightly younger, had slightly lower cognitive ability and were slightly less educated than non-responders. There was, therefore, some selection bias in responding to our survey. However, in all cases the differences were quite small (e.g. d = .23 for cognitive ability) and the subset was thus still fairly representative of the general population.

3　Results

3.1　Comparing 1–7 and 0–100 Likert scales

As noted, for the political questions, we administered 1–7 Likert scales to half our sample, and 0–100 Likert scales to the other half. Rather than running separate analyses within each subgroup and then combining the results using meta-analytic techniques, we decided to combine the subgroups prior to analysis by creating a single variable for each political question. This was done on the basis that within-subgroup

correlations across the political questions were very similar. For the 7-point scales, we calculated both latent and Pearson correlates, and for the 101-point scales, we calculated only Pearson correlations. The correlation between the correlations calculated using Pearson and latent correlations was near unity ($r = .99$), while those across subsamples were high (r's .67-.68). Across groups, correlations between correlation matrices are expected to deviate from unity due to random sampling error.

Three methods for combing the two subgroups were tried:

1. Using endpoints of intervals: i.e., converting 1 on the 7-point scale to 0 on the 101-point scale, and converting 7 to 100. In this case, the 101-point scale is allocated 7 bins, and the mid-point of each bin is assigned to the corresponding value on the 7-point scale. This ensures that the ceiling and floor of the scales are the same. Results are shown in Subfigure 1a.

2. Using midpoints of intervals: i.e., converting 1 on the 7-point scale to 7 on the 101-point scale, converting 2 on the 7-point scale to 21.5 on the 101-point scale, and so on. In this case, the 101-point scale is allocated 7 bins, and the mid-point of each bin is assigned to the corresponding value on the 7-point scale. Results are shown in Subfigure 1b.

3. Using standardized values, i.e., standardizing the values in each sample (converting them to Z scores), and then combining them in a single variable. This method provides some compromise between the first two methods, depending on precisely how values are distributed along the two scales, but comes with the cost of losing the original 0–100 scale. Results are shown in Subfigure 1c.

As Figure 1 indicates, the three methods yielded very similar results. Insofar as this was the case, we opted for the first method, so as to preserve the original scale and keep the ranges identical.
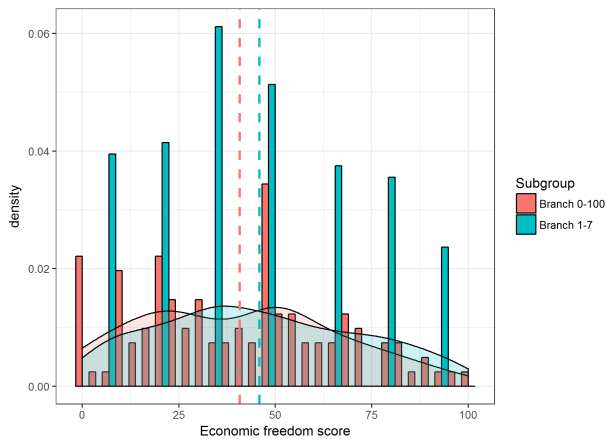
3.2　Cognitive ability

As noted, our cognitive ability data comprises each respondent's answers to the 5 items on the ICAR5 (International Cognitive Ability Resource; (Condon & Revelle, 2014; Kirkegaard & Bjerrekær, 2016b)) test from the original survey, as well as the respondent's answers to the 4 extra items included in our follow-up survey. Pass rates for the 9 items are shown in Table 2. The items vary quite widely in difficultly level, from a low of 2 % correct for the 4th extra item, to a high of 77 % for the 1st item on ICAR5, VR.4.
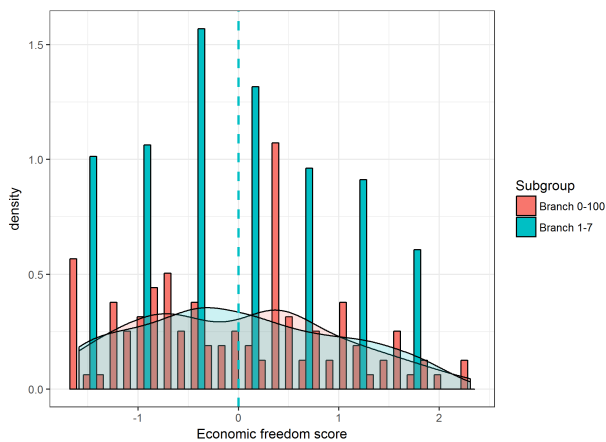
Table 1: Stats for responders and non-responders.

responder	n	age mean	age sd	CA mean	CA sd	edu mean	edu sd	men pct	female pct
FALSE	259	40.83	14.59	0.21	1.02	3.52	1.93	0.49	0.51
TRUE	293	37.42	14.59	-0.02	0.97	3.18	1.80	0.44	0.56
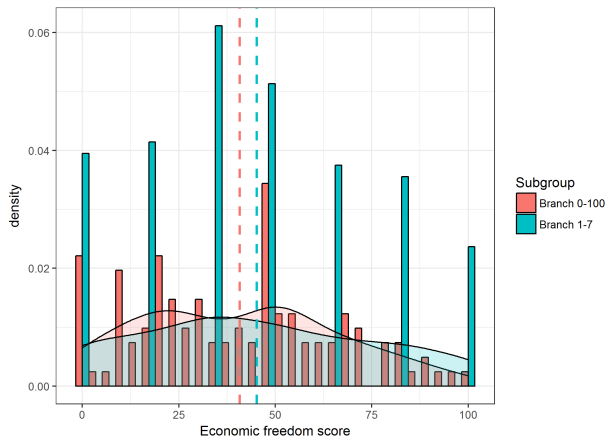
(a) Endpoints method.

(b) Midpoints method.

(c) Z-score method.

Figure 1: Shows the results from three methods for combining the two subgroups.

Table 2: Pass rates for each question related to cognitive ability.

Item	Pass rate
VR 4	0.77
VR 19	0.54
LN 58	0.28
MR 46	0.57
R3D 4	0.14
cognitive 1	0.27
cognitive 2	0.37
cognitive 3	0.36
cognitive 4	0.02

Note that Pinker (2012) reported a pass rate of 5 % for the difficult item, which is not too dissimilar to our figure. Overall, the mean pass rate was 37 % which means that the test was somewhat too difficult. All the inter-correlations were positive (mean $r = .24$), except for some of those pertaining to the 4th extra test, which due to the low variance on this item, had very low precision. The last item was excluded from further analysis.

We utilised a 2-parameter Item Response Theory (IRT) model based on latent correlations to further analyse the cognitive ability data (DeMars, 2010). Figure 2 shows the IRT output. It can be seen that the three CRT items, especially the second one, added non-trivial information over and above that yielded by the original 5 items. The lack of distributional mass on the left-hand side of the chart suggests that the test was slightly too difficult overall. Indeed, only *VR.4* provided substantial information about respondents scoring 1 or more standard deviations below the mean of latent ability. The classical test theory internal reliability (alpha) of the test was .66, which is acceptable but not overly encouraging for a 9-item test (of which only 8 items were used). The correlation between the IRT-based score and the arithmetic sum of scores was $r = .94$. Since the IRT-based score is to be preferred on theoretical grounds, it was utilised for subsequent analyses.

3.3 Political questions

As noted, we specified our predictions concerning what we might find in our pre-study document. One
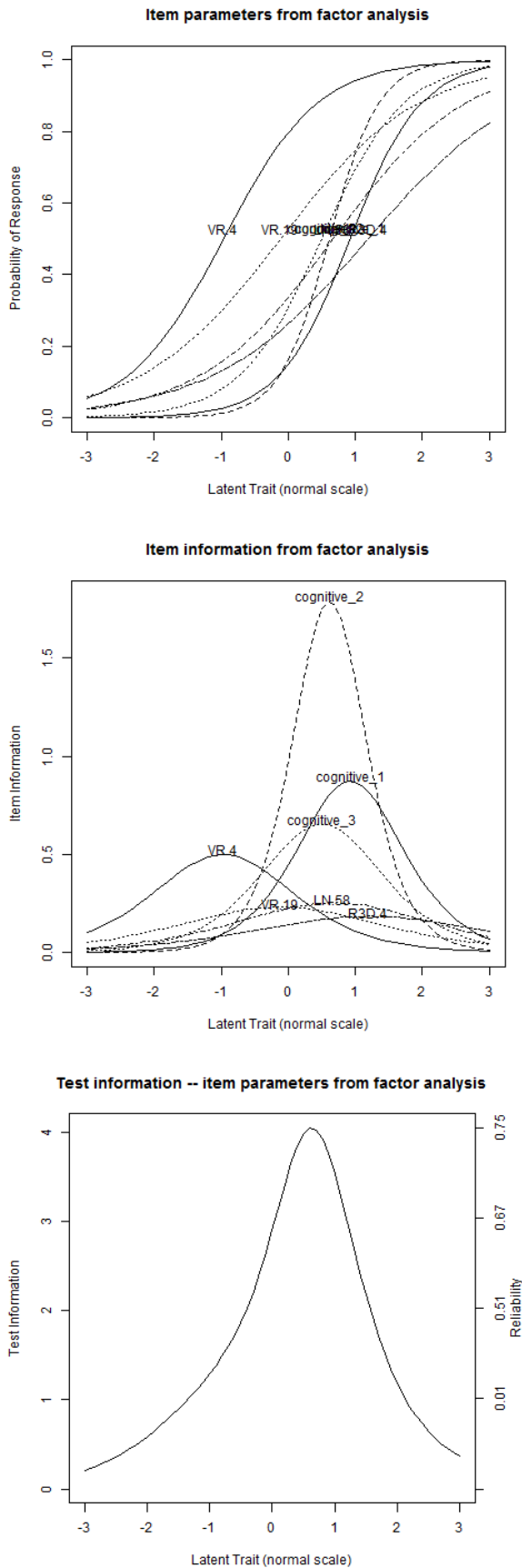
Figure 2: Shows IRT output for questions related to cognitive ability.

of our predictions was that *there will be a common factor for each of the two scales with none or few (<3) items not loading on the common factor in the correct direction*. We tested this prediction using factor analysis, the results from which are given in Figure 3. In both cases, all items loaded in the expected direction: respondents preferring more personal freedom on one issue also tended to prefer more personal freedom on other issues; similarly, respondents preferring more economic liberalism on one issue also tended to prefer more economic liberalism on other issues. Thus, our first prediction was confirmed.

We tried two alternative methods of scoring as well:

1. Simple scaling: i.e., reverse-scoring items as appropriate, and then calculating the mean score across items.

2. Standardized scaling: i.e., reverse-scoring items as appropriate, standardizing each item, and then calculating the mean score across items.

All three pairwise correlations were very large ($r \geq .95$). Insofar as the factor analytic scores are to be preferred on theoretical grounds, namely that they give more weight to the items that were better at measuring the latent trait, we utilised those in subsequent analyses. Internal reliability was calculated from the simple scoring method and was moderate (.60 and .71 for personal and economic liberty, respectively).

As noted, in the original survey, respondents were asked to rate their own agreement with personal liberalism and economic liberalism, respectively. Our predictions concerning these variables were that

a) *self-assessed and measured personal liberalism will correlate poorly (effect size will be r = .20 ± .30)*, and that

b) *self-assessed and measured economic liberalism will correlate moderately (effect size will be r = .40 ± .30)*.

In fact, the correlation between self-assessed and measure personal liberalism was $r = .13$, while the correlation between self-assessed and measure economic liberalism was $r = .49$. These are in fairly close agreement with the values we predicted. As to the relationship between the two measured axes themselves, we predicted that they *will be negatively related (effect size will be r = −.35 ± .15)*. Contrary to our prediction, as Figure 4 shows, there was a positive and slightly non-linear relationship between the two axes in our data. The distribution of scores on personal and economic liberalism did not differ appreciably between the two subgroups administered different Likert scales.
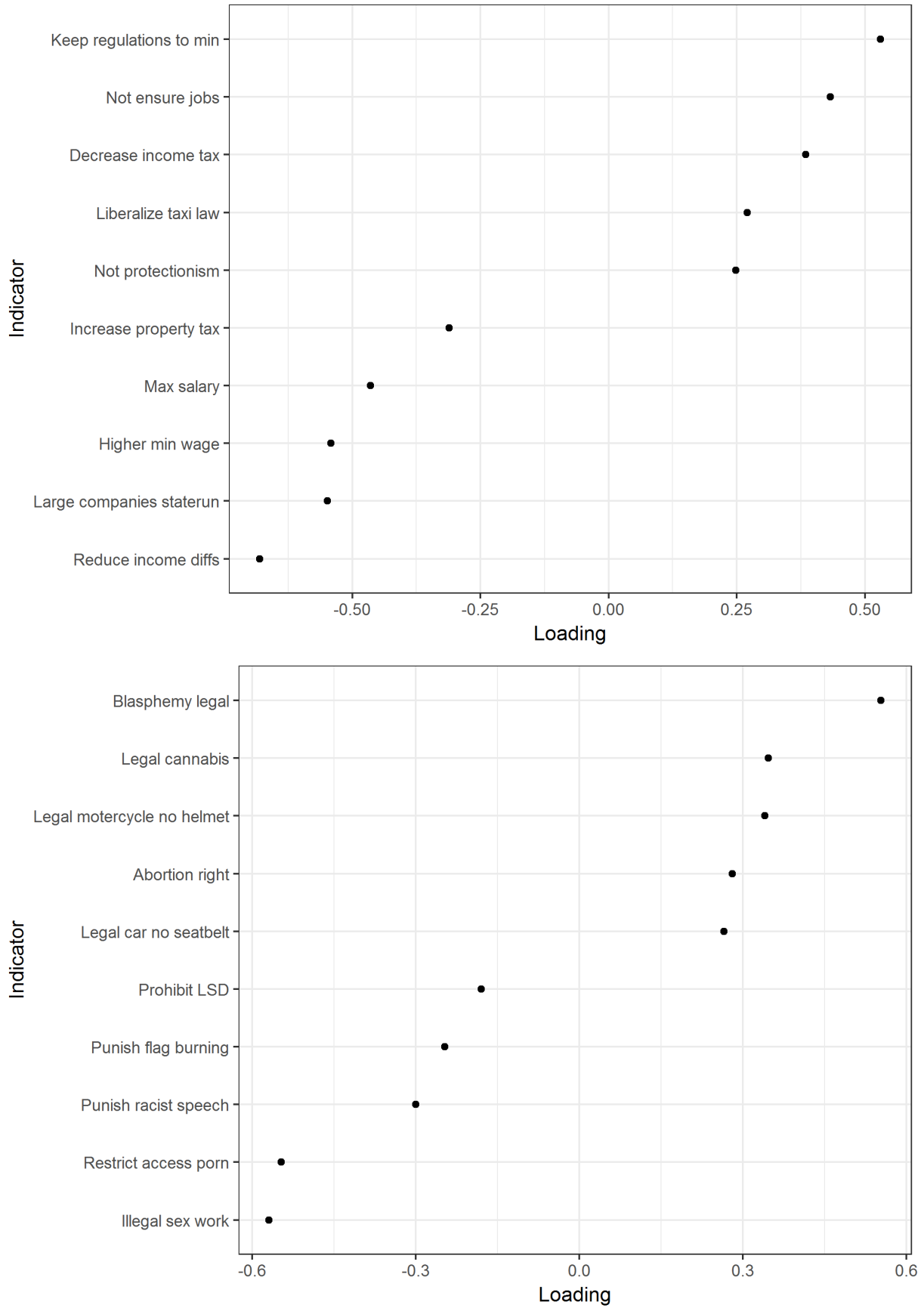
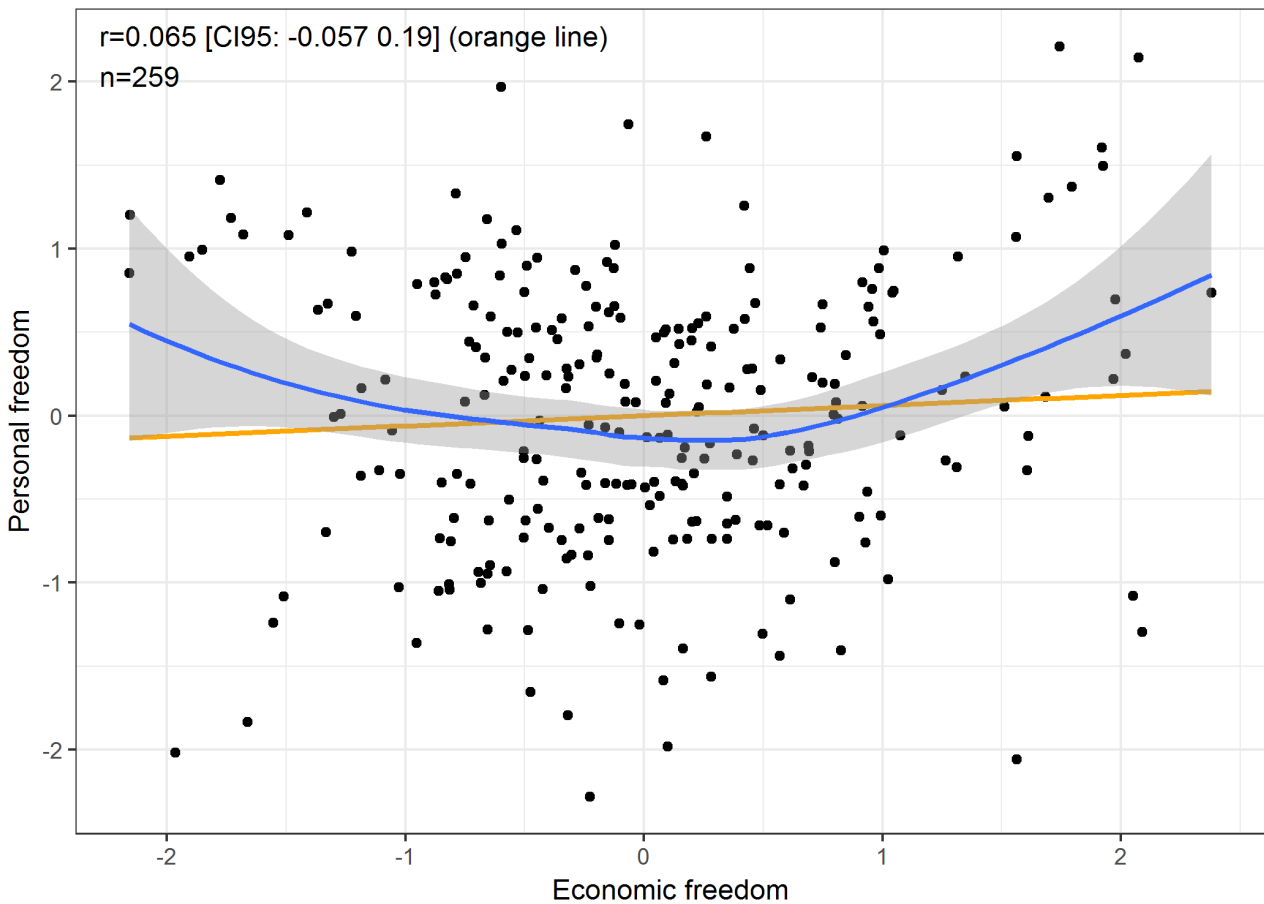**Figure 3:** Shows loadings for social freedom and economic liberalism.

Figure 4: Shows a positive and slightly non-linear relationship between the two axes in our data.

3.4 Relationships between cognitive ability and political axes

Our predictions concerning the relationships between cognitive ability and the political axes were that

a) *cognitive ability will be positively related to the freedom end of both axes (effect sizes will be r = .25 ± .15)*, and that

b) *there wll be a non-linear relationship between cognitive ability and the economic liberalism scale such that the positive slope will decline in strength or perhaps reverse near the end of the ability axis.*

Figure 5 plot cognitive ability's relationship with economic liberalism (Subfigure 5a) and personal liberalism (Subfigure 5b).

Both estimates were positive and their confidence intervals encompass both zero and our predicted range (i.e. .10-.40). Correcting for measurement error requires estimating the test reliability of the scales. We used the internal reliabilities reported above. Table 3 shows the estimated true score correlations.

Table 3: Numbers in the diagonal = reliabilities, below diagonal = uncorrected, above diagonal, corrected.

|	CA	Econ. Lib.	Pers. lib.
CA	0.66	0.10	0.23
Econ. Lib.	0.07	0.71	0.10
Pers. lib.	0.14	0.07	0.60

The corrected correlations were larger, and more in line with our predictions. Unfortunately, it is not straightforward to incorporate a correction for measurement error in multivariate analyses, and this was not done.

Table 4 shows Ordinary Least Squares (OLS) regression results when one includes basic socio-economic co-predictors.

The OLS results were weaker and the confidence intervals overlapped 0, perhaps because some of the effect of cognitive ability was mediated by education, which also had positive relationships which also overlapped zero. Age had a notable negative relationship to personal liberalism, which may be a cohort or age effect. As usually found, male sex predicted preference for
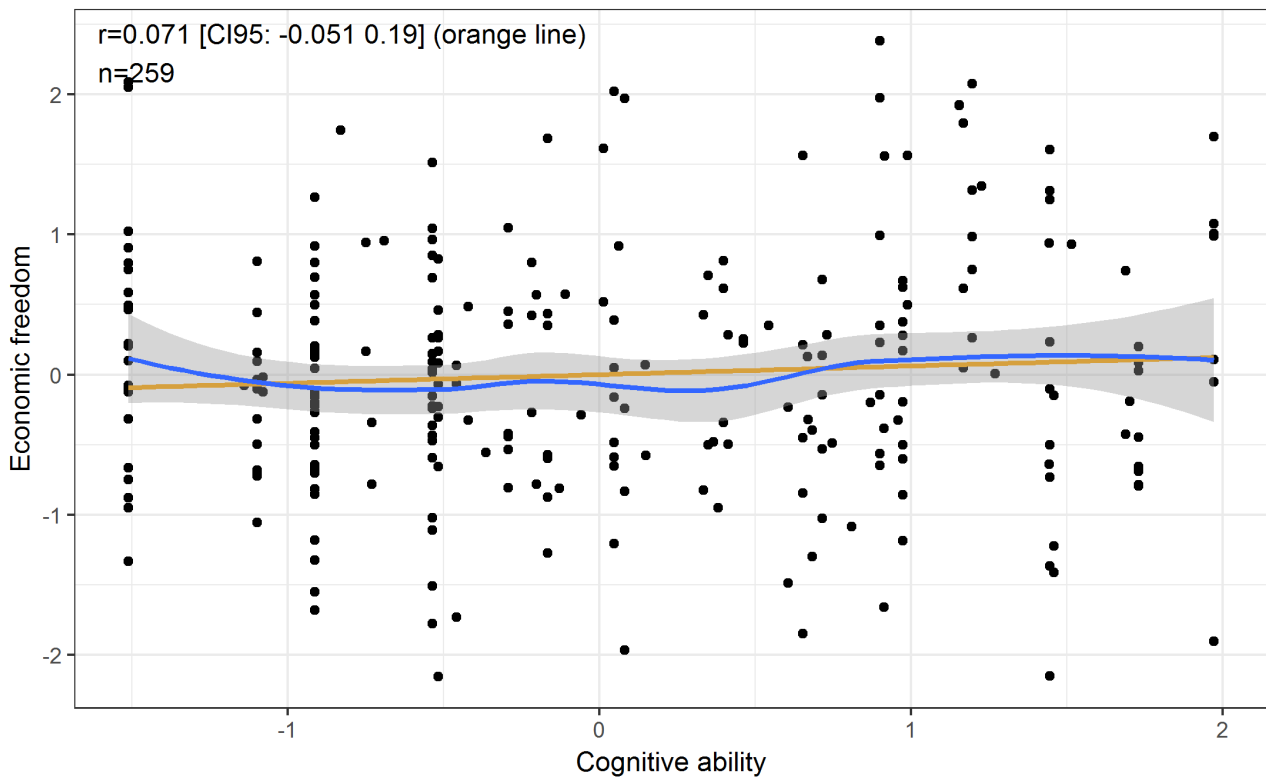
(a) Economic liberalism.
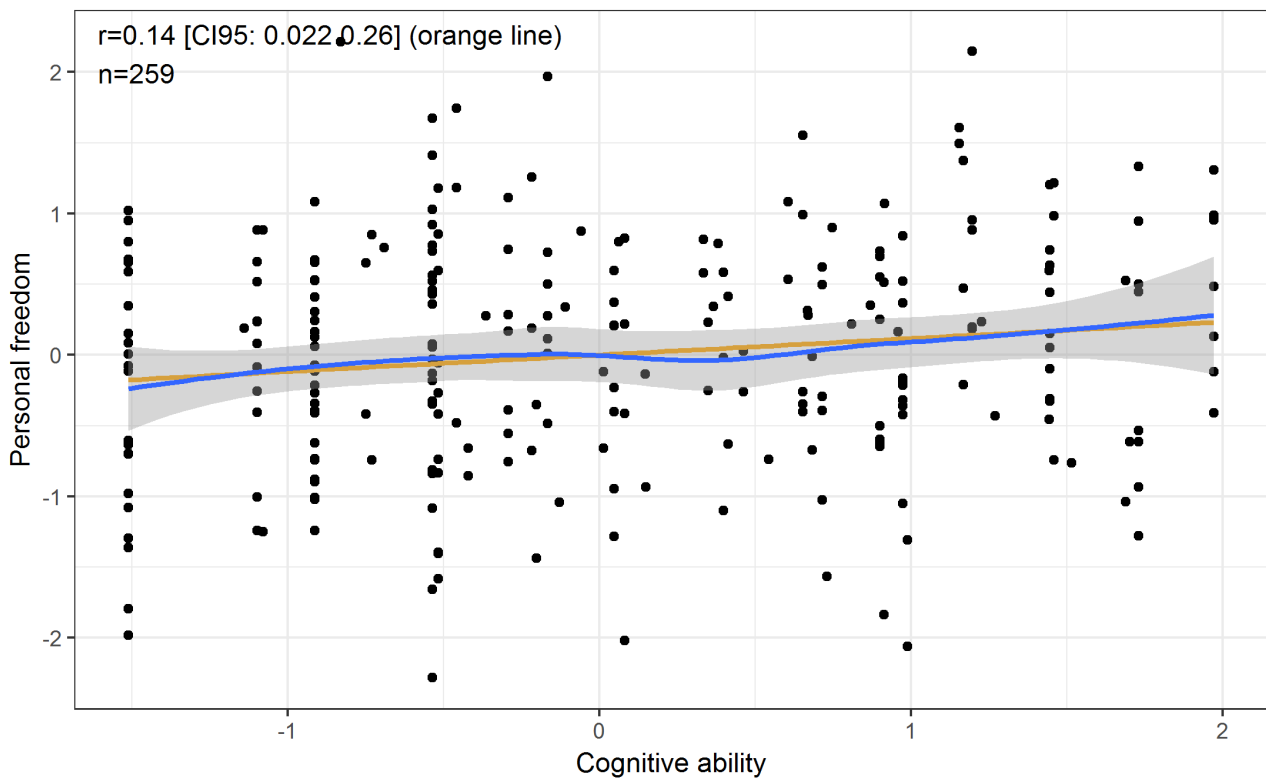
(b) Personal liberalism.

Figure 5: The two subfigures plot cognitive ability's relationship with personal liberalism and economic liberalism.

Table 4: Shows Ordinary Least Squares (OLS) regression results when one includes basic socio-economic co-predictors.

Economic liberalism

Predictor	Beta	SE	CI lower	CI upper
CA	0.03	0.06	−0.09	0.16
Age	−0.08	0.06	−0.20	0.05
Gender: Female	0.00			
Gender: Male	0.29	0.13	0.04	0.54
Education	0.08	0.06	−0.04	0.21
Scale: 0-100	0.00			
Scale: 1-7	0.16	0.12	−0.09	0.40

Personal liberalism

Predictor	Beta	SE	CI lower	CI upper
CA	0.10	0.06	−0.03	0.22
Age	−0.21	0.06	−0.33	−0.09
Gender: Female	0.00			
Gender: Male	0.43	0.12	0.19	0.67
Education	0.10	0.06	−0.03	0.22
Scale: 0-100	0.00			
Scale: 1-7	0.01	0.12	−0.22	0.25

more liberal policies. The type of scale used had no discernible effect in either model.

We also applied LASSO regression, which did not find any good evidence that any predictor was able to predict the political axes. In general, the LASSO is a quite conservative method and so one should not interpret negative results from it as necessarily indicating a lack of a relationship unless sample size is large.

We computed the correlations between cognitive ability and each of the 20 political measures, shown in Table 5. These are corrected for measurement error using .66 as the reliability for cognitive ability and .70 for the single items (Gosling et al., 2003; Littman et al., 2006). Calculating correct confidence intervals for these is complicated and was not done. However, they would span about .30 and so correlations above about .15 are unlikely to be coincidental.

Using the rough guide, 3 of the 20 correlations probably reflect non-chance-level findings: smarter people are for the legality of blasphemy, against increasing the minimum wage, and against the government ensuring jobs for everybody. However, due to 'multiple testing', one cannot be certain about the observed relationships.

3.5 Political parties

As a final exercise, we investigated how the main political parties in Denmark were positioned within the two-dimensional political space defined by the personal and economic axes. We tried two alternative methods of identifying parties' locations. Both

relied on questions included in the original survey that asked respondents to state their percentage agreement with each of the main parties in Denmark:

1. For each party, identify respondents who had at least 80 % agreement with that party, and then calculate the mean personal and economic liberalism scores for those respondents, separately for self-assessed and measured liberalism.

2. For each party, estimate a linear model where percentage agreement with that party is the predictor and where personal and economic liberalism are the outcomes (2 different models). Predict the personal and economic liberalism scores for a hypothetical person who had 100 % agreement with that party. (Note that this method of identifying parties' locations was not one of our pre-registered analyses.)

The results from these two separate methods are shown in Figure 6. Overall, the the two charts are similar but not identical. (For a description of party names, see Appendix A.) LA, the most libertarian party, was consistently positioned in the top right-hand corner, where one would expect it to be. The remaining parties were ordered more-or-less as one would expect along the economic liberalism axis, irrespective of which method was used, and whether one examined self-assessed or measured liberalism: V, the large centre-right party was positioned on the right-hand side along with LA; whereas S, the social democratic party, was positioned on the left-hand side along with the two socialist parties, SF and Ø. Interestingly, DF, which is sometimes considered "far-right" (Fieschi, 2000), is positioned on the centre of both economic axes for measured liberalism. There was little variation among the parties in self-assessed personal liberalism (in line with the lack of correlation between measured liberalism and self-reported liberalism), but somewhat more variation in measured personal liberalism. In fact, the party-level correlation between personal liberalism and economic liberalism was $r = .27$-$.56$, depending on the method, which implies that Danish parties to some degree can be ordered along a one-dimensional liberalism axis––at least with respect to their supporters' preferences (see Bakker et al. (2012)).

4 Discussion

Our study investigated the relationships between cognitive ability and multi-dimensional political preferences in a recent Danish sample. Respondents answered 10 questions pertaining to specific personal issues, 10 questions pertaining to specific economic issues, as well as taking 4 cognitive tests. They had
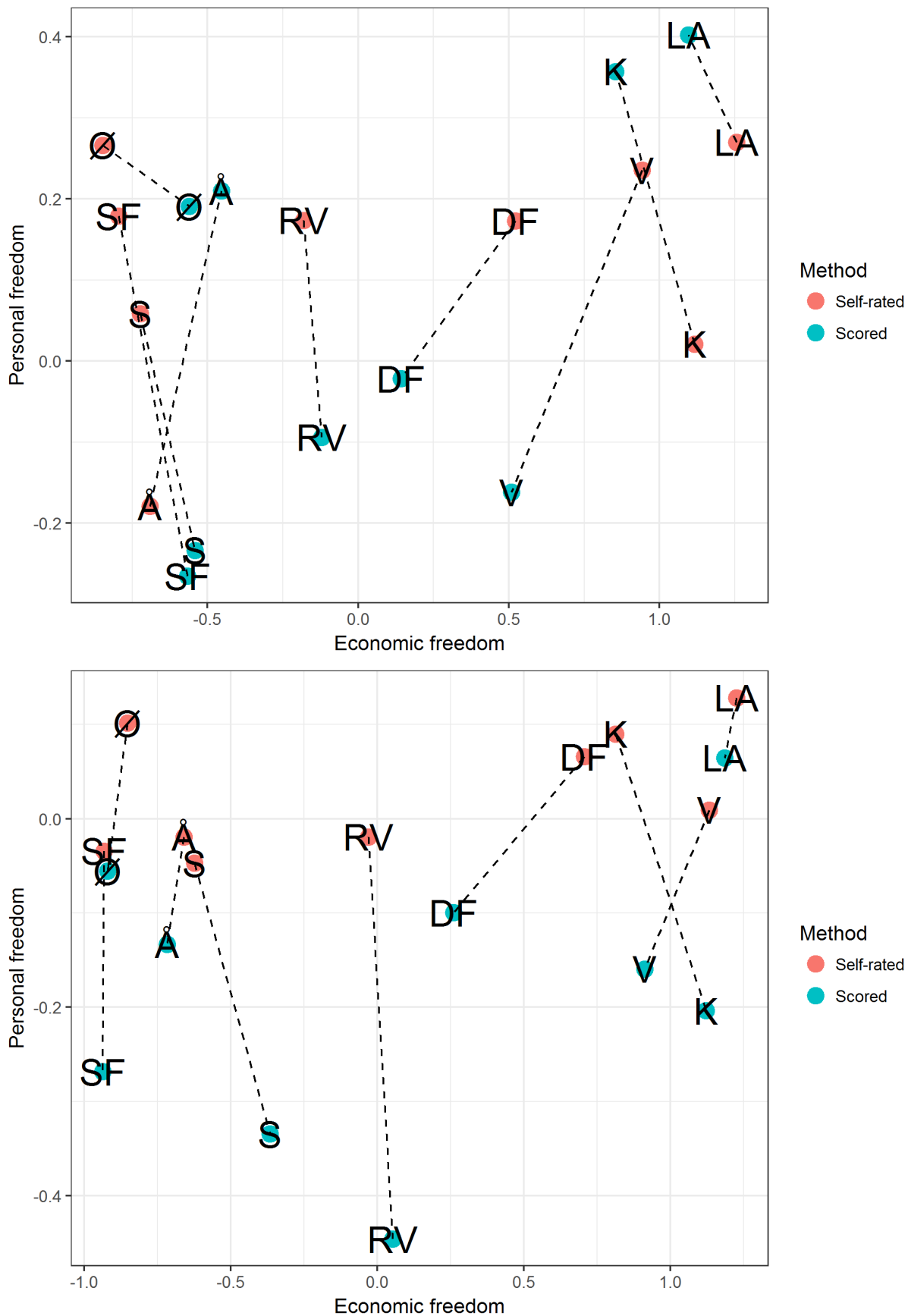
Figure 6: Shows the results from two different methods to identify how the main political parties in Denmark were positioned within the two-dimensional political space defined by the personal and economic axes.

Table 5: Shows the correlations between cognitive ability and each measure of the 20 political measures.

Item	r	Item	r
Not_ensure_jobs	−0.21	Abortion_right	0.11
Higher_min_wage	−0.27	Punish_racist_speech	0.13
Not_protectionism	0.05	Blasphemy_legal	0.27
Max_salary	−0.09	Legal_cannabis	0.07
Decrease_income_tax	−0.07	Prohibit_LSD	−0.01
Increase_property_tax	0.05	Illegal_sex_work	−0.16
Keep_regulations_to_min	0.02	Punish_flag_burning	−0.10
Reduce_income_diffs	−0.12	Legal_motercycle_no_helmet	0.08
Large_companies_staterun	−0.11	Legal_car_no_seatbelt	0.06
Liberalize_taxi_law	0.00	Restrict_access_porn	−0.08

previously taken a 5-item cognitive test, and been asked to rate themselves on personal liberalism and economic liberalism.

We documented a general factor of personal liberalism across the questions on personal issues, and a general factor of economic liberalism across the questions on economic issues. Self-assessed personal liberalism had a small positive correlation with measured personal liberalism ($r = .13$), while self-assessed economic liberalism had a moderate positive correlation with measured economic liberalism ($r = .49$). These findings were in line with our predictions. Personal and economic liberalism both had weak to moderate positive correlations with cognitive ability: $r = .14$ [CI95 % .02 to .26] and $r = .07$ [95 % CI –.05, .19] for personal and economic liberalism, respectively. Both correlations had confidence intervals that overlapped with our predicted range (.10 to .40). When corrected for measurement error, the correlations were .23 and .10, respectively.

The estimate for personal liberalism is close to those that have been found in the previous literature (Carl, 2015b; Onraet et al., 2015). For example, Onraet et al. (2015) reported a meta-analytic effect size for the relationship between cognitive ability and social conservatism of $r = -.20$, which is a similar but somewhat different construct from the personal freedom construct called personal liberalism in this study. Carl (Carl, 2015a) extracted both personal and economic liberalism factors from a large dataset, and found that both were correlated with cognitive ability at .22.

The negative relationship between age and personal liberalism found in this study (-.23 in OLS regression) was also observed in a previous study (Carl, 2015a) which found that the age groups 40-59 and 60-90 had betas of .-19 and -.27.

There are two important limitations to this study. First, the sample was relatively small, and was not entirely representative of the original sample of which it was a subset. Moreover, the original sample may itself be somewhat unrepresentative of the Danish population. If we compare the average age, sex and education in our subsample, in the original sample and in the Danish adult population (those aged 18+), the discrepancies are appreciable but by no means huge (Kirkegaard & Bjerrekær, 2016a). The mean age of Danish adults is 47.1 years, compared to 39.3 in the original sample, and 37.4 in our subsample; 50.3 % of Danish adults are female, compared to 53 % of the original sample, and 56 % of our subsample; and 11.7 % of adult Danes have university degrees, compared to 13 % in the original sample, and 16.2 % in our subsample. Second, our measures were somewhat crude, with estimated reliabilities of only .60 to .71. The cognitive test which comprising just 8 useful items, had somewhat too difficult items (mean pass rate = 37 %) which meant that it provided less discriminability in the left-hand tail.

Acknowledgements

Author contributions

Emil and Noah conceived the study. Emil conduced the statistical analyses. All authors helped write the manuscript and design the questionnaire.

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Appendix A

Party names and ideologies are as follows:

1. EL/Ø: Red-green Alliance; socialist.

2. SF/F: Socialist People's Party; left-wing, democratic socialist, green.

3. Å: The Alternative; centre-left, green.

4. S: Social Democrats: centre-left, social democratic.

5. RV/B: Danish Social Liberal Party; social liberalism.

6. DF/O: Danish People's Party; right-wing populist, anti-immigration.

7. K/C: Conservatives; centre-right, conservative.

8. V: Denmark's Liberal Party; conservative liberalism, agrarianism.

9. LA/I: Liberal Alliance; centre-right, classical liberal.