**Supplementary Material (not for publication)**

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# **Appendix A: Survey Questions**

## *A.1 Prior Beliefs*

*Prior Beliefs about Crime*

First we would like you to assess how many offenses of the Danish criminal code in 2016 were committed by the following groups: (1) people of Danish origin, (2) immigrants and descendants from Western countries, and (3) immigrants and descendants from non-Western countries. We would like your best guess, even if you are not entirely sure.

Offenses of the Danish criminal code include, among other things, sexual crimes, crimes of violence, and property crimes. Please note that the question concerns people who are resident in Denmark and who have been punished according to the Danish criminal code.

For example, if you think that 10 out of 100 offenses of the Danish criminal code were committed by immigrants and descendants from Western countries, you should choose the number 10 under “Immigrants or descendants from Western countries” below.

**In 2016, how many out of 100 offenses do you think were committed by:**

For each measure of prior beliefs, respondents answered on a sliding cursor from 0 to 100.

A.  People of Danish origin.

B.  Immigrants and descendants from Western countries (e.g. Germany, USA, Australia, and Canada).

C.  Immigrants and descendants from non-Western countries (e.g. Syria, Afghanistan, Somalia, and China).

 *Prior Beliefs about Welfare*

First we would like you to assess how many people on social welfare in 2016 came from the following groups: (1) people of Danish origin, (2) immigrants and descendants from Western countries, and (3) immigrants and descendants from non-Western countries. We would like your best guess, even if you are not entirely sure.

Social welfare includes the following benefits and groups: regular social assistance, start help, disability pension, early retirement, unemployment benefits, parental leave, and other similar benefits where you receive benefits from the state instead of employment. Recipients of educational grants (SU recipients) are not included. Please note that the question concerns people who are resident in Denmark and received social welfare in Denmark.

For example, if you think that 10 out of 100 people who received social welfare in Denmark in 2016 were immigrants or descendants from Western countries, you should choose the number 10 under “Immigrants and descendants from Western countries” below.

**In 2016, how many out of 100 people on social welfare in Denmark were:**

For each measure of prior beliefs, respondents answered on a sliding cursor from 0 to 100.

A.  People of Danish origin.

B.  Immigrants and descendants from Western countries (e.g. Germany, USA, Australia, and Canada).

C.  Immigrants and descendants from non-Western countries (e.g. Syria, Afghanistan, Somalia, and China).

*Prior Beliefs about Size*

First we would like you to assess how many people living in Denmark in 2016 came from the following groups: (1) people of Danish origin, (2) immigrants and descendants from Western countries, and (3) immigrants and descendants from non-Western countries. We would like your best guess, even if you are not entirely sure.

For example, if you think that 10 out of 100 people who were resident in Denmark in 2016 were immigrants or descendants from Western countries, you should choose the number 10 under “Immigrants and descendants from Western countries” below.

**In 2016, how many out of 100 people who were resident in Denmark were:**

For each measure of prior beliefs, respondents answered on a sliding cursor from 0 to 100.

A.  People of Danish origin.

B.  Immigrants and descendants from Western countries (e.g. Germany, USA, Australia, and Canada).

C.  Immigrants and descendants from non-Western countries (e.g. Syria, Afghanistan, Somalia, and China).

## *A.2 Treatments*

*Crime Treatment*

We are interested in whether you have heard about a story that was recently on the news.

The story was: A new report from Statistics Denmark shows that 21 out of 100 persons who were convicted of a violation of the Danish criminal code in 2016 were immigrants or descendants from non-Western countries.

Have you heard about this story?

*Welfare Treatment*

We are interested in whether you have heard about a story that was recently on the news.

The story was: A new report from Statistics Denmark shows that 14 out of 100 persons who received public support in Denmark in 2016 were immigrants or descendants from non-Western countries.

Have you heard about this story?

*Size Treatment*

We are interested in whether you have heard about a story that was recently on the news.

The story was: A new report from Statistics Denmark shows that 8 out of 100 persons residing in Denmark are immigrants or descendants from non-Western countries.

Have you heard about this story?

## *A.3 Policy Opinions*

*Crime Opinions*

1. Politicians should make it easier to expel criminal immigrants.

2. In the fall of 2016 the government tightened the rules of expulsion of criminal immigrants making it easier to expel criminal immigrants. Do you support or oppose this law?

*Welfare Opinions*

1. Refugees and immigrants who live in Denmark should have the same right to economic support as ethnic Danes, even if they are non-citizens.

2. In 2015, the government reduced the integration aid, which means that unemployed refugees are only eligible for about half the economic support of Danes. Do you support or oppose this law?

*Size Opinions*

1. Denmark should receive more refugees than is the case today.

2. In 2016, the Danish government for the first time since 1978 refused to receive UN quota refugees. Do you support or oppose this decision?

## *A.4 Posterior Beliefs*

Same as A1. Prior Beliefs

## *A.5 Interpretations*

*Crime Interpretations*

When you think back on the report from Statistics Denmark, which showed that 21 out of 100 violations of the Danish criminal code were committed by immigrants or descendants from non-Western countries, do you then think that this number is very high, high, neither nor, low, or very low?

*Welfare Interpretations*

When you think back on the report from Statistics Denmark, which showed that 14 out of 100 who received public support in Denmark in 2016 were immigrants or descendants from non-Western countries, do you then think that this number is very high, high, neither nor, low, or very low?

*Size Interpretations*

When you think back on the report from Statistics Denmark, which showed that 8 out of 100 people residing in Denmark are immigrants or descendants from non-Western countries, do you then think that this number is very high, high, neither nor, low, or very low?

# **Appendix B: Supporting Results**

##

## *B.1 Sample Characteristics*

In our sample, the median age was 30 years (SD = 15 years), and 50 percent were female. 10 percent of our participants had not graduated from high school, 21 percent had vocational training, 13 percent were high school graduates, 11 percent had some college education or were currently enrolled in college, 27 percent were college graduates, 16 percent had a post-college degree, while 2 percent did not answer the question. The median income of the participants was “between $60,000 and $74,999” (400,000 DKK and 499,999 DKK). On a 10-point political ideology self-identification measure, 1 denoting the left-wing extreme and 10 denoting the right-wing extreme, the median number was 5.

## *B.2 Prior and Posterior Distributions*

Figure B.1 Distributions of Priors and Posteriors



*Note*: Each panel displays the distribution of the respective prior or posterior, where we have summed the questions concerning non-Western immigrants, Western immigrants, and Danes.

Figure B.2. Prior Expectations by Immigrant Group



*Note*: Each panel displays the distribution of the respective prior about non-Western and Western immigrants. The Panels demonstrate that respondents were in fact able to distinguish between the different groups of immigrants.

Figure B.3. What Predicts Prior Beliefs?



*Note*: Each panel displays the correlation (from a multivariate regression) between each covariate and the respective prior. Educational reference category = primary school. 95 % confidence intervals based on the heteroscedastic standard errors.

##

Figure B.4. Posterior Beliefs by Treatment Status. Confidence Intervals



*Note:* The figure replicates the results of Figure 1, but includes bootstrapped 95 % confidence intervals.

## *B.3 Balance Tests*

Figure B.5. Covariate Balance Tests



*Note*: Each filled black circle shows an estimated placebo effect for each pre-treatment covariate. Estimations compare the mean of the treated group to the mean of the control group. Black lines show 95% confidence intervals based on robust standard errors against heteroscedasticity. The tests show that the pre-treatment covariates are well-balanced on average and thus support the key identifying assumption of random assignment.

## *B.4 Codings of Underestimators and Overestimators*

We group our participants into four categories according to their prior beliefs. First, we define underestimators as participants who hold prior beliefs that are below the true value. Second, we define small overestimators as participants with prior beliefs above or equal to the true value, but within the 33.33 percentile of the distribution on the priors. Third, we take moderate overestimator to be participants with prior beliefs within the 33.33-66.67 percentiles. Finally, large overestimators are participants above the 66.67 percentile.

##

## *B.5 Updating of Posteriors*

Column 1 of Table B.1 shows the overall effect estimates of regressing posterior beliefs on the treatment indicator: The posterior beliefs of the average participant in the welfare treatment and crime treatment groups are about 8 percentage points lower than the average respondent in the control group. The posterior belief of the average participant in the size experiment is adjusted downward by about 5.5 percentage points. These findings lend credence to the argument that people do not avoid new facts, but willingly incorporate them into their posterior beliefs. However, we may push the argument further and examine whether respondents with different prior beliefs update their posteriors differently in response to the same treatment. In particular, if participants willingly update, then we would expect participants with prior beliefs further away from the true value to update their posteriors the most when exposed to correct information. To explore this proposition, we replicate the overall effects while splitting the sample according to the priors.[[1]](#footnote-1) Indeed, the results show that participants respond very differently to the same treatments depending on their prior beliefs. Column 2 of Table B.1 shows the effect estimates of participants with a bias below 0. Theoretically, we would expect that these underestimators adjusted their posteriors upward in light of new information. For the welfare posterior, the point estimate indicates that the treatment increases the posterior by about 2 percentage points; however, the estimate is insignificant. For the crime posterior, the point estimate is close to 0 and far from significant. By contrast, the size treatment increases the size posterior by about 4 percentage points. Among participants with a small bias, we expect our treatments to have little, if any, negative impact on the corresponding posteriors. Column 3 of Table B.1 shows the effects estimates. We observe no significant effect of the welfare and size treatments, while respondents who received the crime treatment update their posterior by about 4 percentage points. Given an outcome mean of 0.11 and a standard deviation of 0.14, this posterior update is quite substantial by about 1/3 of a full standard deviation on the outcome.

Table B.1. Effect on Posterior Expectations by Prior Biases

|  |  |
| --- | --- |
| Outcome | Welfare Posterior |
| Sample | Full Sample | Bias<0 | Small Overestimation | Moderate Overestimation | Large Overestimation |
| Welfare Treatment Effect | -0.078\*\*\*(0.017) | 0.022(0.049) | -0.018(0.020) | -0.050\*(0.023) | -0.116\*\*\*(0.024) |
| Observations | 797 | 54 | 248 | 220 | 275 |
| Outcome mean | 0.30 | 0.04 | 0.12 | 0.30 | 0.51 |
| Outcome standard deviation | 0.25 | 0.18 | 0.16 | 0.17 | 0.21 |
| Outcome | Crime Posterior |
| Sample | Full Sample | Bias<0 | Small Overestimation | Moderate Overestimation | Large Overestimation |
| Crime Treatment Effect | -0.080\*\*\*(0.017) | -0.003(0.018) | -0.043\*(0.020) | -0.144\*\*\*(0.024) | -0.095\*\*\*(0.028) |
| Observations | 814 | 168 | 217 | 216 | 213 |
| Outcome mean | 0.20 | -0.02 | 0.11 | 0.25 | 0.43 |
| Outcome standard deviation | 0.24 | 0.12 | 0.15 | 0.19 | 0.22 |
| Outcome | Size Posterior |
| Sample | Full Sample | Bias<0 | Small Overestimation | Moderate Overestimation | Large Overestimation |
| Size Treatment Effect | -0.054\*\*\*(0.014) | 0.039\*(0.015) | 0.019(0.018) | 0.013(0.016) | -0.063\*(0.030) |
| Observations | 819 | 143 | 232 | 214 | 230 |
| Outcome mean | 0.18 | 0.03 | 0.07 | 0.16 | 0.39 |
| Outcome standard deviation | 0.20 | 0.11 | 0.10 | 0.12 | 0.22 |

*Note:* Heteroscedastic robust standard errors in parentheses. \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. Posteriors and priors are centered on the true value, which for welfare equals 0.14, for crime 0.21, and for size 0.08.

For participants with a moderate bias, we expect a larger updating effect compared to participants with a small bias. Again, we observe no difference between the control group and respondents who received the size treatment (column 4 of Table B.1). By contrast, respondents who received the welfare treatment update their posterior by 5 percentage points compared to the control group (column 4 of Table B.1). Given an outcome mean of 0.30 and a standard deviation of 0.17, the treatment gives rise to a substantial update—among participants with a moderate bias—by about 1/3 of a full standard deviation on the outcome. Similarly, the crime treatment leads to about a 14 percentage points updating of the crime posterior, which is 3/4 of a full standard deviation on the outcome (column 4 of Table B.1). Among participants with a large bias, the welfare treatment on average leads to about 11.5 percentage points downwards adjustment of the welfare posterior (column 5 of Table B.1). This is more than half of a full standard deviation on the outcome. Similarly, the crime treatment moves the crime posterior 9.5 percentage points compared to the control group, which is about 45 percent of a full standard deviation on the outcome (column 5 of Table B.1). The effect of the size treatment is about -6.5 percentage points (column 5 of Table B.1). In sum, we find that respondents are willing to incorporate the experimental treatment information and update their factual beliefs about non-Western immigrants on the welfare and crime dimensions. Moreover, we find support for the proposition that the updating process depends on participants’ prior beliefs. This means that participants who underestimate the immigration quantities (bias below 0) update their posteriors upwards, whereas participants who overestimate the quantities (bias above 0) update their posteriors downwards. Furthermore, participants with a large bias update their posterior more than participants with a small bias. Table B.2 replicates the above results using models that regress the posterior outcomes on the treatment indicators, the priors, and the linear interaction between the two, while Figure B.6 plots the marginal treatment effects over the prior biases. The findings below show that the linear interaction models yield results that are very similar to the subgroup analyses above. This further corroborates that the updating process depends on prior beliefs. In particular, the analyses confirm that the larger the participants’ prior bias, the greater the posterior update.

Table B.2. Linear Estimation of the Interaction between Treatments and Priors

|  |  |  |  |
| --- | --- | --- | --- |
| Outcome | Welfare Posterior | Crime Posterior | Size Posterior |
| Treatment | 0.02(0.02) | -0.05\*\*\*(0.01) | 0.02\*(0.01) |
| Prior | 0.87\*\*\*(0.03) | 0.79\*\*\*(0.04) | 0.82\*\*\*(0.03) |
| Treatment x prior | -0.20\*\*\*(0.05) | -0.12\*\*(0.05) | -0.04(0.06) |
| Observations | 797 | 812 | 819 |

*Note:* Effect estimates with heteroscedastic robust standard errors in parentheses. \*p < 0.05, p < 0.01, p < 0.001. Outcomes and treatments are centered on the true value, which for welfare equals 0.14, for crime 0.21, and for immigration 0.08.

Figure B.6. Marginal Treatment Effects over Prior Bias



*Note:* Distributions of prior bias (centered on the true value). Marginal treatment effects over prior bias. 95-% confidence intervals based on heteroscedastic robust standard errors. The findings of the linear interaction models are very similar to the findings of the subgroup analyses in the main text.

Figure B.7 respond to the objection—against our main results—that participants were not able to distinguish between immigrant groups when evaluating our treatment material. Consistent with discussions of Figures B.1 and B.2, Figure B.7 shows that the treatment effects on posteriors about ethnic Danes and Western immigrants are substantively different from those about non-Western immigrants. Taken together, this validates our information treatments.

Figure B.7 Effects on Posterior Expectations by Ethnic Group



*Note*: Black filled circles display effects on the respective posterior about non-Western immigrants: grey filled triangles display effects on the respective posterior about non-Western immigrants; dark grey squares display effects on the respective posterior about ethnic Danes.

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## *B.6 Effect of Treatments on Policy Opinions*

Table B.3. Effect on Policy Opinions by Prior Biases

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample | Full Sample | Bias<0 | Small Overestimation | Moderate Overestimation | Large Overestimation |
| Welfare Treatment Effect | 0.001(0.012) | 0.030(0.051) | -0.011(0.020) | -0.002 (0.020) | 0.030(0.017) |
| Observations | 797 | 54 | 248 | 220 | 275 |
| Outcome mean | 0.75 | 0.68 | 0.68 | 0.77 | 0.82 |
| Outcome standard deviation | 0.16 | 0.19 | 0.16 | 0.15 | 0.14 |
| Crime Treatment Effect | 0.000(0.012) | 0.007(0.025) | 0.008(0.022) | -0.013(0.019) | 0.008(0.002) |
| Observations | 814 | 168 | 217 | 216 | 213 |
| Outcome mean | 0.75 | 0.65 | 0.73 | 0.79 | 0.82 |
| Outcome standard deviation | 0.17 | 0.16 | 0.16 | 0.14 | 0.16 |
| Size Treatment Effect | 0.004(0.012) | 0.009(0.033) | 0.029(0.024) | 0.039(0.021) |  -0.005(0.019) |
| Observations | 819 | 143 | 232 | 214 | 230 |
| Outcome mean | 0.75 | 0.69 | 0.74 | 0.78 | 0.78 |
| Outcome standard deviation | 0.17 | 0.17 | 0.18 | 0.16 | 0.14 |

*Note:* Heteroscedastic robust standard errors in parentheses. \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. Posteriors and priors are centered on the true value, which for welfare equals 0.14, for crime 0.21, and for size 0.08.

Figure B.8. Marginal Treatment Effects over Prior Bias



*Note:* Distributions of prior bias (centered on the true value). Marginal treatment effects over prior bias. 95-% confidence intervals based on heteroscedastic robust standard errors. The findings of the linear interaction models are very similar to the findings of the subgroup analyses in the main text.

Figure B.9 responds to a potential objection against our results, namely the link between our treatments—that provide information about non-Western immigrants—and our policy questions that asks both about refugees (i.e., non-Western immigrants) and immigrants. If participants’ were able to make the link between non-Western immigrants and refugees—as we intended—we should expect the relatively uniform effects across the question wordings. Indeed, the analyses in Figure B.9 demonstrates that irrespective of the wording of the policy questions there is no effect of the information treatments.

Figure B.9. Effect Estimates on each Item



*Note*: In each experiment, the filled black circle represents the effect estimate from regressing the respective policy question on the treatment indicator while controlling for the prior. Refugees 1: *“Denmark should receive more refugees than is the case today”*; Refugees 2: *“In 2015, the government reduced the integration aid, which means that unemployed refugees are only eligible for about half the economic support of Danes. Do you support or oppose this law?”*; Refugees 3: *“In 2016, the Danish government for the first time since 1978 refused to receive UN quota refugees. Do you support or oppose this decision?”;* Immigrants 1: *“Politicians should make it easier to expel criminal immigrants”; Immigrants 2: “In the fall of 2016 the government tightened the rules of expulsion of criminal immigrants making it easier to expel criminal immigrants. Do you support or oppose this law?”*; Refugees and Immigrants*: “Refugees and immigrants who live in Denmark should have the same right to economic support as ethnic Danes, even if they are non-citizens”*. 95 % confidence intervals based on heteroscedastic robust standard errors.

## *B.7 Effect of Treatments on Interpretations*

Table B.4. Effect on Interpretations by Prior Biases

|  |  |
| --- | --- |
| Outcome | Welfare Interpretations |
| Sample | Full Sample | Bias<0 | Small Overestimation | Moderate Overestimation | Large Overestimation |
| Welfare Treatment Effect | 0.133\*\*\*(0.019) | 0.159\*(0.064) | 0.103\*\*\*(0.029) | 0.182\*\*\* (0.034) | 0.123\*\*(0.036) |
| Observations | 797 | 54 | 248 | 220 | 275 |
| Outcome mean | 0.49 | 0.56 | 0.47 | 0.45 | 0.51 |
| Outcome standard deviation | 0.27 | 0.25 | 0.23 | 0.23 | 0.31 |
| Outcome | Crime Interpretations |
| Sample | Full Sample | Bias<0 | Small Overestimation | Moderate Overestimation | Large Overestimation |
| Crime Treatment Effect | 0.073\*\*\*(0.018) | 0.009(0.032) | 0.019(0.032) | 0.055(0.034) | 0.192\*\*\*(0.039) |
| Observations | 814 | 168 | 217 | 216 | 213 |
| Outcome mean | 0.59 | 0.62 | 0.61 | 0.56 | 0.59 |
| Outcome standard deviation | 0.25 | 0.21 | 0.23 | 0.25 | 0.30 |
| Outcome | Size Interpretations |
| Sample | Full Sample | Bias<0 | Small Overestimation | Moderate Overestimation | Large Overestimation |
| Size Treatment Effect | 0.089\*\*\*(0.019) | -0.037(0.044) | 0.060(0.036) | 0.115\*\*(0.037) | 0.134\*\*(0.039) |
| Observations | 819 | 143 | 232 | 214 | 230 |
| Outcome mean | 0.52 | 0.56 | 0.54 | 0.50 | 0.48 |
| Outcome standard deviation | 0.27 | 0.24 | 0.27 | 0.27 | 0.29 |

*Note:* All estimates are based on models that control for prior beliefs. Heteroscedastic robust standard errors in parentheses. \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. Posteriors and priors are centered on the true value, which for welfare equals 0.14, for crime 0.21, and for size 0.08.

Figure B.10. Marginal Treatment Effects over Prior Bias



*Note:* Distributions of prior bias (centered on the true value). Marginal treatment effects over prior bias. 95-% confidence intervals based on heteroscedastic robust standard errors. The findings of the linear interaction models are very similar to the findings of the subgroup analyses in the main text.

1. Small bias is defined by participants whose prior is equal to or larger than the true value, but within the 33.33 percentile. Moderate bias is defined by participants whose prior is larger than the 33.33 percentile, but smaller than the 66.66 percentile. Large bias is defined by participants whose prior is larger than the 66.66 percentile. [↑](#footnote-ref-1)