Cognitive Abilities and the Demand for Bad Policy*

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Abstract

Rational choice theories assume that voters accurately assess the outcomes of policies. However, many important policies—such as regulating prices and introducing Pigouvian taxation—yield outcomes through indirect or *equilibrium effects* that may differ from their direct effects. Citizens may underestimate these effects, leading to a demand for bad policy, that is, opposition to reforms that would increase welfare or support for reforms that would decrease it. This appreciation might be linked to cognitive functions, raising important research questions: Do cognitive abilities influence how individuals form preferences regarding policies, especially untried reforms? If so, what is the underlying mechanism? We use a simple theoretical framework and an experiment to show that enhanced cognitive abilities may lead to better policy choices. Moreover, we emphasize the crucial role of beliefs about *other citizens'* cognitive abilities. These findings have important policy implications as they suggest that educational programs developing cognitive skills or interventions increasing trust in others' understanding could improve the quality of democratic decision-making in our societies.

Keywords: Voting, Policy Reform, Political Failure, Cognition, Experiment
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1 Introduction

Public policy decisions are the crucial test of the effectiveness of democratic societies, where citizens are expected to choose among various options. Reliance on democratic choice is reasonable if citizens can effectively discern the relative merits of policy alternatives. Voting theories based on rational choice assume that voters are capable of effectively evaluating the comparative advantages of different policy options (Downs, 1957; Feddersen and Pesendorfer, 1996, 1997; Feddersen, 2004; McMurray, 2013). However, many policies are complex and produce outcomes not only through their immediate effects but also through indirect or equilibrium effects that the average voter may not readily understand.

The indirect effects of policies often emerge from changes in incentives and subsequent adjustments in citizens' behavior, which could take time to materialize and be recognized. These include policies that can have profound implications on the economy and society, such as regulating prices (e.g., minimum wage and rent control), imposing Pigouvian taxes, monetizing fiscal deficits, expanding road infrastructure, and introducing Universal Basic Income. As noted by Smith (1776), North (1990), Romer (2003), Caplan (2011), Beilharz and Gersbach (2016), and Achen and Bartels (2017), the average citizen may not fully appreciate these equilibrium effects, potentially leading to a misjudgment about the efficacy of certain policies. More recently, fascinating research by Dal Bó, Dal Bó and Eyster (2018) and Vora (2023) points to the phenomenon of individuals voting against policies that, despite imposing direct costs, would ultimately resolve social dilemmas and enhance overall welfare.

These observations raise intriguing research questions: How do the electorate's cognitive abilities influence the formation of preferences regarding public policies? What is the underlying mechanism through which this influence is exerted? Our study tackles these questions by proposing a simple theoretical framework and an experimental design explicitly tailored to investigate one potential channel through which cognitive abilities could play a role.

In seeking to ground our theoretical and experimental approach in real-world relevance, we draw upon motivational evidence from the "Understanding Society" dataset. This UK-based dataset offers a rich set of socio-demographic and cognitive skill variables, allowing for an in-depth analysis of the correlations between cognitive abilities and policy preferences. Table 1 indicates strong correlations between cognitive abilities and policy preferences, even after controlling for socio-demographic variables. This evidence is suggestive but not without its limitations. The direction of causal inference is unclear, and there are multiple possible interpretations of the observed correlations.

Accordingly, this paper seeks to address these limitations by investigating one potential channel: the hypothesis that greater cognitive abilities lead to a greater understanding of the indirect effects of untested policies. By employing a fine-grained measurement of participants' own cognitive abilities and introducing an exogenous manipulation of beliefs about others' cognitive abilities, our study is uniquely positioned to provide novel answers to our research questions. In particular, our theoretical framework and experimental results highlight that, in order to support reforms with direct costs and indirect benefits or to oppose reforms with direct benefits and indirect costs, voters need not only to understand policies' equilibrium consequences but also to trust other citizens to do the same, allowing us to isolate the causal impact of cognitive abilities on policy preference formation. We will revisit the results in Table 1 in the conclusions at the end of the paper, analyzing these correlations through the lens of our experimental findings.

We recruited a large and representative sample of UK nationals and, in line with our hypothesis, show that reforms with direct costs and indirect benefits are unpopular, supported only by citizens with high cognitive abilities and high confidence in others' cognition. At the same time, our analysis unveils some surprising patterns: there seems to be a non-monotonic relationship between cognitive abilities and reform support, and there appears to be an effect of individual education that is similar to, but independent of, cognitive abilities.

The research questions we set out to investigate are fundamental to understanding the intricacies of policy-making and voting behavior and have challenged researchers across various fields, including economics, psychology, and political science. Our work contributes to a blossoming literature analyzing how cognitive abilities influence behavior in games (Burks et al. 2009, Alaoui and Penta 2016, Gill and Prowse 2016, Proto, Rustichini and Sofianos 2019, 2022, Fe, Gill and Prowse 2022, Lambrecht et al. Forthcomimg).[1] The current paper advances this frontier, investigating how cognitive abilities influence the formation of policy preferences.

More directly related to our work, Deary, Batty and Gale (2008b), Morton, Tyran and Wengström (2011), Oskarsson et al. (2015), Zmigrod, Rentfrow and Robbins (2020), and Durante, Pinotti and Tesei (2019) provided some evidence on the relationship between cognitive abilities and policy preferences.[2] However, the use of observational data in these studies presents considerable challenges. Establishing causal relationships on the basis of such data is challenging due to potential confounding factors and the complexity of isolating specific causal pathways.

The rest of the paper is organized as follows. In Section 2, we delve deeper into the theoretical underpinnings of our research, setting the stage for the experimental methodology that is described in Section 3. In Section 4, we analyze the choice data from the experiment. In Section 5, we implement a textual analysis of two open questions asked to participants at the end of the experimental sessions. Finally, in Section 6, we provide some conclusions and policy implications.

[1]Agranov et al. (2012) and Halevy, Hoelzemann and Kneeland (2023) study how behavior in games depends on opponents' observed characteristics that may be correlated with their strategic sophistication (e.g., whether the opponent is a Ph.D. student or an undergraduate student).

[2]Sunshine Hillygus (2005), Deary, Batty and Gale (2008a), Denny and Doyle (2008), and Elinder and Erixson (2022) study how cognitive skills (often proxied with education) are associated with turnout. Dal Bó et al. (2017) analyze the relationship between cognitive abilities and selection into a political career.

Table 1: **Correlates of Party Preferences in the UK:** Multinomial Logit Estimator. Data from Understanding Society, Wave 3 (2011-2012). The NS-Based IQ is calculated using a numerical series task and benchmarked to the UK population. Income is total monthly gross income expressed in thousands of pounds. The omitted choice is Conservative. The omitted education category is Post Graduate Degree. Robust Standard Errors are in brackets; * p-value < 0.10, ** p-value < 0.05, *** p-value< 0.01

	Labour	Lib Dem	SNP	Green	None
NS-Based IQ	–0.0187***	0.0096***	–0.0012	–0.0023	–0.0114***
	(0.0021)	(0.0033)	(0.0055)	(0.0033)	(0.0020)
Age	–0.0261***	–0.0050*	–0.0050	–0.0125***	–0.0221***
	(0.0020)	(0.0027)	(0.0045)	(0.0027)	(0.0018)
Female	0.0623	0.3916***	0.0577	–0.0056	0.1004*
	(0.0616)	(0.0861)	(0.1454)	(0.0896)	(0.0557)
Income	–0.1281***	–0.0679**	–0.0578	–0.1527***	–0.1207***
	(0.0228)	(0.0281)	(0.0470)	(0.0373)	(0.0204)
Graduate Degree	–0.0144	–0.0864	–0.2599	–0.0468	0.0925
	(0.1208)	(0.1471)	(0.2885)	(0.1600)	(0.1123)
Further Secondary	–0.2796**	–0.3321**	0.3657	–0.4116**	–0.0858
	(0.1360)	(0.1692)	(0.2938)	(0.1851)	(0.1262)
Secondary Education	–0.1564	–0.5054***	–0.2664	–0.4073**	0.3648***
	(0.1189)	(0.1499)	(0.2772)	(0.1628)	(0.1097)
Primary or no	0.2809**	–0.5084***	0.2689	–0.5009***	0.6692***
	(0.1279)	(0.1685)	(0.2936)	(0.1829)	(0.1188)
Constant	3.7444***	–1.2251***	–1.6297**	0.4919	3.1730***
	(0.2745)	(0.4109)	(0.6818)	(0.4152)	(0.2559)
Psuedo R-Squared	0.0219				
N	13278				

2 Conceptual Framework and Hypotheses

We follow Dal Bó, Dal Bó and Eyster (2018) (DBDBE henceforth) conceptual framework to formulate specific hypotheses. Consider the two games presented in Table 2. In both cases, two players must simultaneously choose between Cooperate (C) and Defect (D). In the top panel, Cooperation results in a cost c for the player and a benefit b for the opponent, with $b > c > 0$. This is a classical Prisoner's Dilemma game (PD henceforth) where defect is a dominant strategy, so that the unique Nash Equilibrium of this game is (D,D).

Now we consider a policy proposal that would impose on each player taxes t_C and t_D, respectively, on cooperation and defection. If this proposal passed and was implemented, it would transform the payoffs of the game as illustrated in the bottom of Table 2. Taxes are set to satisfy the following conditions: $b > t_D > t_C + c$. The dominant strategy of the resulting game, labeled as Harmony Game by DBDBE (HG henceforth), becomes cooperation, leading to a unique efficient Nash Equilibrium (C,C).

Table 2: **The Games**

Prisoner's Dilemma

	C	D
C	$b-c, b-c$	$-c, b$
D	$b, -c$	$0, 0$

Harmony Game

	C	D
C	$b-c-t_C, b-c-t_C$	$-c-t_C, b-t_D$
D	$b-t_D, -c-t_D$	$-t_D, -t_C$

If given the choice between PD and HG, a player who anticipates the equilibrium behavior in both games would prefer to play the HG: the equilibrium payoff in HG is $b - c - t_C > 0$, while the equilibrium payoff in PD is 0. Hence, having to express a preference on games ex-ante, perfectly rational players with common knowledge of rationality would choose the HG. In the current paper, we depart from this concept of perfect rationality and common knowledge of rationality and we assume instead that rationality depends on players' strategic sophistication — which, in turn, depends on their own cognitive abilities — and on beliefs about other players' strategic sophistication — which, in turn, depends on beliefs about other players' cognitive abilities. At the same time, we continue to assume that players choose the option that maximizes their expected payoffs, given their beliefs; in other words, they best-respond to their beliefs.

Accordingly, we define θ_i and θ_o, both in $\left[\underline{\theta}, \overline{\theta}\right]$, as player i's cognitive ability and the opponent's cognitive ability, respectively. We also introduce beliefs about the opponent's action, which we then assume to be naturally related to the opponent's cognitive ability. We denote with $q^G(\theta)$ the probability that a player of cognitive ability θ chooses the dominant action in game G, and with $q_o^G(\theta_i, \theta_o)$ i's belief that the opponent chooses the dominant action in game G. Recall that in our design the cognitive ability measure θ_o of the opponent is observed by the player.

In our experiment, we will use the same payoffs set by DBDBE in their experimental design. Accordingly, we substitute the parameters $b = 6, c = 2, t_C = 1, t_D = 4$, in the two matrices presented in Table 2, which leads to the payoff matrices presented in Table 3.

Table 3: **The Games with Experimental Parameters**

Prisoner's Dilemma

	C	D
C	$9,9$	$3,11$
D	$11,3$	$5,5$

Harmony Game

	C	D
C	$8,8$	$2,7$
D	$7,2$	$1,1$

In the games from Table 3, Defect is a dominant action in PD, and Cooperate is a dominant action in HG. We expect that:

Assumption 2.1. *Players with greater cognitive ability are more likely to choose the dominant action, starting from random choice at minimal cognitive ability:* $q^G(\underline{\theta}) = 1/2$ *and* $q^G(\theta_i)$ *is strictly increasing in* θ_i.

Consider now the belief on opponent's behavior, $q_o^G(\theta_i, \theta_o)$. Given that Cooperate is the dominant action in HG and Defect is the dominant action in PD, we expect that more optimistic beliefs about the opponent' cognitive ability, θ_o, would correspond to more optimistic beliefs about the opponent cooperating in HG, and more pessimistic beliefs about the opponent cooperating in PD. However, we posit that this is true only if player i has sufficiently high cognitive ability for the player to be at least somewhat strategically sophisticated and, thus, be able to form a minimal understanding of the game, i.e., $\theta_i \geq \hat{\theta}$.

We therefore make the following two Assumptions. The first:

Assumption 2.2. *Players with sufficiently low cognitive abilities believe that opponents choose randomly in the game, independently of their own cognitive ability: if $\theta_i \leq \hat{\theta}$, then, for every θ_o and G, $q_o^G(\theta_i, \theta_o) = 1/2$.*

The second assumption is:

Assumption 2.3. *Players with sufficiently high cognitive abilities believe that opponents with greater cognitive abilities are more likely to choose the dominant action, starting from random choice at the minimal ability: if $\theta_i > \hat{\theta}$, $q_o^G(\theta_i, \underline{\theta}) = 1/2$ and $q_o^G(\theta_i, \theta_o)$ is strictly increasing in θ_o.*

Therefore, defining $\Delta_C \equiv q_o^{HG} - (1 - q_o^{PD})$ as the difference in the probability of opponent's cooperation between HG and PD, we have that a player with the pair (θ_i, θ_o) of own and other's cognitive ability supports the policy proposal — that is, prefers HG to PD — if and only if:

$$\Delta_C(\theta_i, \theta_o) \geq \frac{2 + 2q^{PD}(\theta_i) - q^{HG}(\theta_i)}{6}; \tag{1}$$

hence:

Proposition 2.1. *Player i prefers HG to PD if and only if (a) has sufficiently high cognitive abilities and (b) believes the opponent has sufficiently high cognitive abilities.*

Proof. From Assumption 2.1, the RHS of 1 goes from 5/12 to 1/2, strictly increasing in θ_i. From Assumptions 2.2 and 2.3, $\Delta_C = 0$ if $\theta_i \leq \hat{\theta}$ or $\theta_i > \hat{\theta}$ and $\theta_o = \underline{\theta}$. From Assumption 2.3, Δ_C is strictly increasing in θ_o if $\theta_i > \hat{\theta}$ □

3 Experimental Design

Our experimental design and hypotheses were pre-registered on the Open Science Framework (OSF).[3] We recruited a total of 701 participants from the database of volunteers managed by

[3]See `https://osf.io/mjpsu/?view_only=13201a5b01324d969a030279506c3d88`.

Prolific. Care was taken to ensure that the sample was demographically representative of the United Kingdom's population with respect to age, gender, and ethnicity. This demographic representation strengthens the external validity of our findings and enables us to infer more general conclusions.

Each subject participated in two separate sessions, conducted one day apart. In the first session, we measured participants' cognitive abilities with three tasks. First, participants had up to 15 minutes to complete 18 Raven's Advanced Progressive Matrices (Part 1). Raven's matrices are commonly used to evaluate fluid intelligence, that is, the ability to engage in non-verbal abstract reasoning and to solve a problem independently of previously acquired knowledge. This was followed by a 6-question numerical sequences task from the UK Household Longitudinal Study (Part 2), testing again fluid intelligence through numerical reasoning and pattern recognition. The first session ended with a 6-question Cognitive Reflection Test (Part 3) aimed at assessing participants' capacity to override an intuitive response with one that requires more deliberation. We provide more details of these tests in the next section, where we illustrate our main descriptive statistics.

The second session had three parts. In Part 4, participants played five rounds of a one-shot Prisoner's Dilemma (PD) and one round of a one-shot Harmony Game (HG). In each of these rounds, participants were matched with a different participant from a previous study. Since the PD represents the status quo institution citizens have earned experience with, participants were given feedback on the opponent's action and the corresponding earnings after each round of the 5 PDs. On the other hand, since the HG is the untried reform, subjects are not given any feedback after the single round of the HG.[4]

In Part 5, participants played two additional rounds. In each round, they were offered the choice between playing a PD or an HG with an opponent from a previous study (different from any opponent met in any previous round). Before choosing the game, subjects were

[4] Note that, in DBDBE, participants only play either 5 rounds of the PD or 5 rounds of the HG with feedback before being asked to choose between institutions. We decided to have our subjects play at least one round of both games to measure their propensity to identify and choose the dominant action in both the PD and the HG, as this is an important element of our theoretical framework.

informed of their opponent's score in the Raven's matrices task from Part 1. We used a within-subject manipulation: each subject met exactly one opponent with a low score (i.e., 3 Raven's matrices out of 18 solved correctly) and exactly one opponent with a high score (i.e., 15 Raven's matrices out of 18 solved correctly), in random order. Subjects also learned that participants' performance ranged from 0 to 18 matrices solved correctly with an average of 9. In the instructions for Part 5, subjects were told that the opponent's performance in Part 1 could be regarded as a measure of "general intelligence and abstract reasoning" (see Figure A.3 in Appendix A.2). After choosing the game, subjects chose their action in the game selected for that round but did not get any feedback on the opponent's choice and on their earnings until the end of Part 5.

Finally, in Part 6, we collected some socio-demographics data and information on participants' political preferences. This segment included open-ended questions (which we report below) designed to gauge participants' opinions on the potential consequences of real-world untried policies, providing insight into their ability to evaluate and predict policy outcomes. Appendix A.1 reports an overview of the timing of both sessions.

Following the pre-registered design, subjects who failed an attention check at the beginning of the first session were not invited to the second session and excluded from the dataset; subjects who failed a comprehension quiz at the beginning of the second session were excluded from the survey and the dataset. The median completion time for the first session was 22 minutes, and participants were rewarded with £3 for completing it. To reduce cheating and to keep our measurements comparable with those from the UK Household Longitudinal Study and other studies meant to gauge IQ in representative samples of the UK, the tasks measuring cognitive abilities were not incentivized with monetary rewards. Subjects were told that they would learn their score alongside information about the other participants' performance during the second session (and they learned their scores at the end of the study). The median completion time for the second session was 16 minutes. Participants were rewarded with £2 for completing it plus a bonus determined by a random round from Part 4 and a random round from Part 5. The bonus ranged between £0.66 and £11.33 averaging around £4.

Matching Protocol. Since the experiment was conducted online (as a means to reach a large sample representative of the UK general population), we faced some constraints when implementing games, especially given the need for our subjects to be matched with 8 different opponents and to earn experience with the Prisoner Dilemma (thus, requiring feedback on others' behavior in this game) before choosing between institutions. Here, we detail how we solved this issue.[5] In Part 4, our participants were matched with 6 different participants in the laboratory experiments conducted at Brown and UC Berkeley by DBDBE. This means that our participants' opponents played the Prisoner Dilemmas and the Harmony Game simultaneously with other participants in the same laboratory experiment. For the PDs in rounds 1 through 5, we matched our subjects with participants to the corresponding round in Part 1 of the Control, Random Dictator, Majority Once, and Majority Repeated treatments in DBDBE. For the HG in round 6, we matched our subjects with participants to round 1 in Part 1 of the Reverse Control and Reverse Random Dictator treatments in DBDBE. This ensures that our subjects and their opponents have the same degree of experience with each game.

In Part 5, our subjects were matched with participants who were recruited from the same subject pool, who participated in an identical first session measuring cognitive abilities, and who answered correctly to either 3 (low cognitive abilities opponents) or 15 (high cognitive abilities opponents) Raven's matrices in Part 1 of the first session. These opponents participated in a different version of the second session (that took place before the standard version of the second session). In this session, subjects played 5 rounds of the PD with feedback and 1 round of the HG without feedback against participants from a previous study (as in Part 4 of the standard version of the second session). Then, they played an additional round of

[5] Our matching protocol is similar to the "replacement method" used in Alaoui and Penta (2016) and Alaoui, Janezic and Penta (2020).

the PD and an additional round of the HG (in random order) against participants from a previous study (the laboratory experiments from DBDBE) without knowing the opponent's cognitive abilities and without feedback on the opponent's choice. This guarantees that our subjects and their opponents had the same degree of experience with the PD and the HG before Part 5 and allows our subjects to choose unilaterally what game to play in the two rounds of Part 5.

This matching protocol was clearly explained to subjects (see screenshots in Appendix A.2). We remark that, in addition to making the online implementation feasible, this design removes social preferences (since subjects' actions do not affect the earnings of others). This is an important feature of our design as it reduces the chance that game payoffs misrepresent subjects' preferences for outcomes and thus allows us a tighter control on what actions are dominant or dominated. This is an important element of our theoretical framework, which posits greater cognitive abilities lead to a greater chance of choosing dominant actions.

4 Results

4.1 Descriptive Statistics

Table 4 shows descriptive statistics for our sample of 701 subjects. Participant's average age is 47.2 years, close to the median of the UK adult population (49), as reported by the Office for National Statistics (ONS) in 2022. The gender composition of our sample, with a female proportion of 51.1%, mirrors the UK general population according to the 2021 Census data. Socioeconomically, our participants report higher average household incomes than the UK median household income of £38,100 before taxes in 2022 (ONS data); and they also demonstrate greater educational attainments: 67% hold at least a higher education degree compared to 40.6% of the UK adult population, as reported by Eurostat in 2022. Finally, we note that in our sample there are only 8 respondents declaring to have only Primary Education. For this reason, in the following analyses, we indicate respondents with Secondary and Primary Education together and consider this category as the baseline; considering them separately and changing baseline would not change qualitatively the analysis.[6]

Table 4: Individual Characteristics

Variable	Mean	Std. Dev.	Min.	Max.	N
Age	47.257	15.64	20	84	701
Female	0.511	0.5	0	1	701
Raven Score	9.016	3.313	0	18	701
CRT Score	3.25	1.702	0	6	701
Numerical Series Score	541.422	22.966	427.1	579.6	701
Household Income	50.424	33.803	0	150	701
Post-Graduate	0.227	0.419	0	1	701
Graduate	0.441	0.497	0	1	701
Further Secondary	0.17	0.376	0	1	701
Secondary	0.151	0.359	0	1	701
Primary	0.011	0.106	0	1	701

Our study evaluates cognitive abilities using three indicators. The Raven Score and the Numerical Series Score measure general cognitive ability, lateral thinking, and the ability to solve new problems without drawing on prior knowledge (Cattell, 1963). The Raven Score is derived from logic-based graphical puzzles and is not contingent on numerical or verbal aptitude, whereas the Numerical Series Score inherently depends on numeracy levels (Fisher et al., 2013); for this reason, we consider the Raven score as our preferred indicator of cognitive abilities (as reported in the pre-registration). We included the Numerical Series Score in our experiment to facilitate comparison with the UK Household Longitudinal Study, also known as "Understanding Society", which is a large dataset representative of the UK population including political preferences. The Cognitive Reflection Test (CRT) measures an individual's propensity to suppress an instinctive erroneous answer and engage in reflective thought (Frederick, 2005).

Table 5 presents the correlations among the different cognitive skill assessments. Notably, the correlation between the Raven Score and the CRT Score, depicted in Figure 1, exceeds

[6] The category Further Secondary indicates the second part of secondary education studies that in the UK is separated from the first part because more specific to the choices planned by a student after the secondary education.

Table 5: Correlation between Cognitive Skills and Education

Variables	Raven	CRT	Numerical Series	Raven (6 items)
Raven	1.000			
CRT	0.472	1.000		
Numerical Series	0.407	0.418	1.000	
Raven (6 items)	0.841	0.402	0.330	1.000

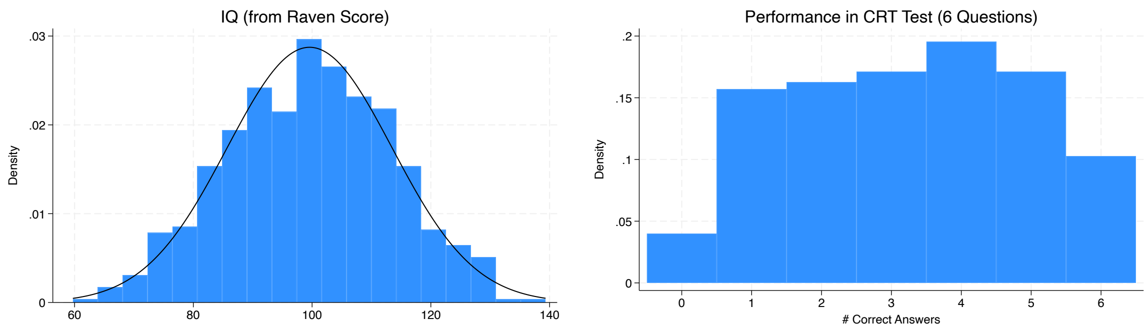
the commonly reported correlation of approximately 0.3 (e.g., Willadsen et al., 2024). This divergence could be due to our employment of an extended 6-question CRT, in contrast to the traditional 3-question version. Finally, we also reported the correlation with a Raven Score calculated using only 6 matrices (1, 7, 13, 19, 25, 31) as opposed to 18 to make it more comparable to the CRT Score. We will use this measure in some robustness analyses below. In table A.3 of the appendix we present the correlation between educational attainments and cognitive ability measures.

To gauge how our sample fares in terms of cognitive abilities with respect to the UK general population, we computed our participants' IQ using their Raven Score (which, as we pre-registered, is our preferred measure of cognitive ability). We benchmarked these scores against the UK general population using the 2022 age distribution (ONS data) and age-specific performance data from the user manual for Raven's matrices Raven (2003). The benchmarks follow the completion of 36 matrices without a time limit.[7] For practicality and to avoid excessively long participation times, we set a 15-minute time limit and reduced the number of matrices to 18, selecting only the odd-numbered ones. To estimate the IQ, we then doubled our participants' Raven Scores based on the assumption that solving one matrix suggests the ability to solve the next. This method may slightly inflate the scores. Nonetheless, the 15-minute (or 900 seconds) time limit, with subjects averaging 672.33 seconds and a median of 690.5 seconds, likely mitigated any overestimation. As it is customary, for calculating the IQ, we normalized the UK population mean to 100 and its standard de-

[7]Using the scores from the Raven's matrices user manual and the age distribution, we estimated an average of 18.23 matrices solved correctly with a standard deviation of 7.6.

viation to 15.[8] We display the IQ distribution of our sample in the right panel of Figure 1. Reassuringly, the median IQ in our sample is 100, and approximately 80% of our subjects scored between 82 and 116, with 5% exceeding a score of 124, paralleling the IQ distribution expected in the UK general population.

Figure 1: **Cognitive Abilities Distributions:** The Raven Based IQ is calculated using the adult UK population as the benchmark. The details are in the text.



4.2 Behavior in Games and Preferences over Policies

Our analysis begins by testing Assumption 2.1, which posits that subjects with greater cognitive abilities are more inclined to choose dominant actions. In Table 6, we report the estimates of a Logit model that examines the correlation between a subject's own cognitive abilities and the choice to Defect, the dominant action in a Prisoner's Dilemma (PD). From Round 1 to Round 5, there is a positive correlation between Raven Score and the selection of the dominant action, Defect, with this correlation appearing to strengthen over time (increasing from about 3% to 9% per unit standard deviation in round 4 and decreasing to about 7% in round 5). When both measures of cognitive abilities are included, as in this table, the CRT Score does not show a significant effect. A similar trend is evident in the single round of the Harmony Game (HG) included in this part of the experiment: subjects with a greater Raven Score are more likely to choose the dominant action, Cooperate. Moreover, in this second game, the coefficient of the CRT Score is statistically significant, and its

[8]Therefore, we calculated the IQ using this formula $IQ = 2 * RavenScore - 18.23) * (15/7.16) + 100$, where 18.23 and 7.16 are the estimated average and standard deviation within the UK general population.

magnitude is larger than the magnitude of the Raven Score coefficient (noting that both measures are expressed in standard deviations).[9]

This result has a natural interpretation: subjects that suppress an instinctive answer and think before making a decision are able to form a better understanding of a novel strategic interaction, that is, a game they play for the first time. Figure 2 visually represents these findings.

In Section D of the Appendix, we provide supplementary analyses. Table A.6 shows that the CRT Score is typically positively correlated with choosing to Defect in the PD and negatively correlated with choosing to Defect in the HG when it is the sole cognitive skill indicator in the regression. In Table A.7, we report the results of similar regressions with only the Raven Score. These findings can be summarized into the following key insight:

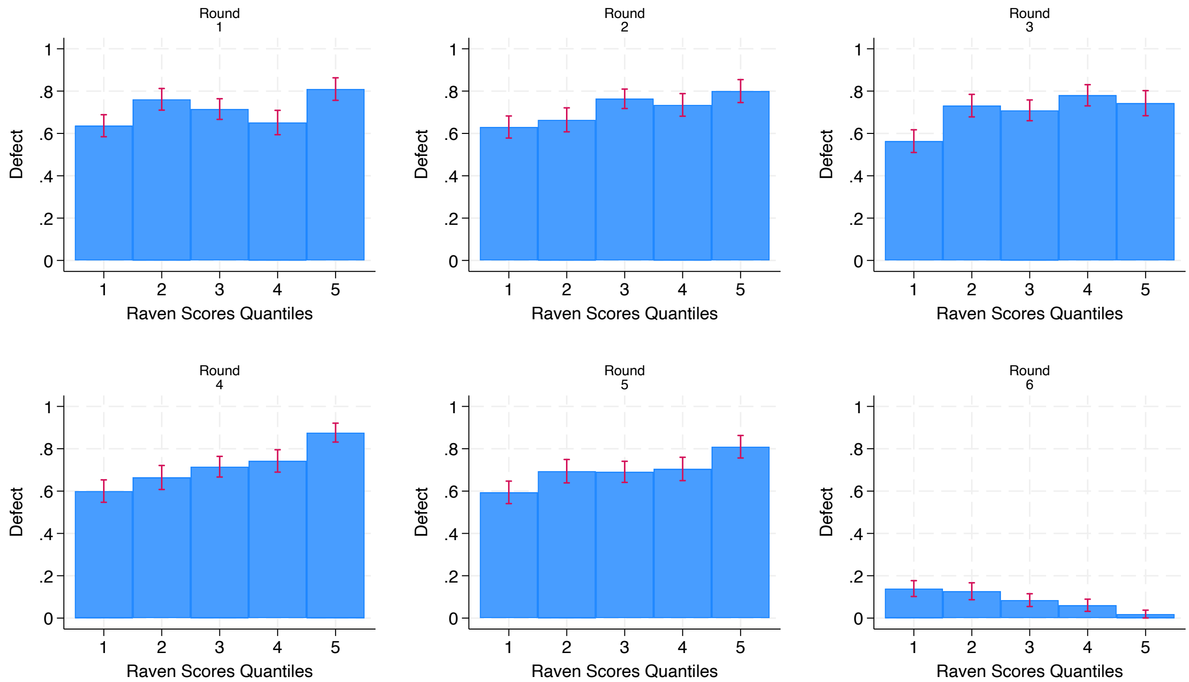
Result 1. *Participants with higher cognitive abilities are more adept at identifying the dominant action through a process of learning in the PD, and through introspection and cross-learning in the HG.*

Table 6: **Effect of Own Cognitive Abilities on Cooperative Behaviour:** The binomial dependent variable is the action Defect. Raven and CRT Scores are standardized (that is, transformed to have mean 0 and standard deviation 1). Socio-Demographics controls include: Age, Age squared, Gender, Education and Income. The coefficients represent the marginal effect and are calculated using a Logit estimator. Robust Standard Errors; $p - values$ are in brackets; * $p - value < 0.1$, ** $p - value < 0.05$, *** $p - value < 0.01$

	Prisoners' Dilemma					Harmony Game
	Round 1	Round 2	Round 3	Round 4	Round 5	Round 1
	b/p	b/p	b/p	b/p	b/p	b/p
Raven Score (std)	0.0360*	0.0601***	0.0712***	0.0950***	0.0707***	–0.0252**
	(0.0695)	(0.0018)	(0.0004)	(0.0000)	(0.0003)	(0.0287)
CRT Score (std)	–0.0121	–0.0356*	0.0161	–0.0138	–0.0204	–0.0374***
	(0.5518)	(0.0746)	(0.4199)	(0.4855)	(0.3229)	(0.0039)
Socio-Demographics	Yes	Yes	Yes	Yes	Yes	Yes
N	701	701	701	701	701	701

[9] In Table A.4 of the Appendix, we report qualitatively identical results as in Table 6, but we add the previously hidden coefficients of the control variables and the sum of earnings from past rounds as a further control. In Table A.5, we use a coarser Raven Score (obtained using only 6 matrices: 1, 7, 13, 19, 25, 31) which is more comparable with the score obtained in the 6-items CRT. Here, the Raven Score coefficients become smaller, as it is to be expected given the noisier measurement, but the results are qualitatively identical to those from Table 6.

Figure 2: **Raven Scores and Actions in Part 4 Games:** Defection rates by Raven Score quantiles in the 5 rounds of PD and in the sole round of HG from Part 4. The red bar represents the 95% confidence interval.



Moving on to preferences between policies or games, we specifically examine Proposition 2.1, which asserts that a preference for the Harmony Game (HG) over the Prisoner's Dilemma (PD) occurs only among players who have sufficiently high cognitive abilities and believe their opponent to be sufficiently capable.

Table 7 shows that a participant's Raven Score is positively correlated with the choice of HG, increasing the probability of about 6% per standard deviation when paired with a high-cognitive-abilities opponent, as shown in column 1. However, this correlation is absent when facing an opponent with low cognitive abilities, as indicated in column 2. Column 3, which considers both treatments together, demonstrates that the interaction between Raven Score and the treatment is both positive and significant. This observation leads us to the following conclusion:

Result 2. *Participants with greater cognitive abilities (that is, greater Raven Score) are* *more inclined to select the Harmony Game over the Prisoner's Dilemma when their opponent is perceived as being better cognitively able (that is, having a greater Raven Score).*

Table 7: **Effect of Raven Score, CRT Score, Education and Opponent's Cognitive Abilities on Preferences over Games:** The binomial dependent variable is the vote for the HG. Raven and CRT Scores are standardized. The omitted education category is secondary or primary education. Socio-Demographics controls include: Age, Age Squared, Gender, and Income. The coefficients represent the marginal effect and are calculated using a Logit estimator. Robust Standard Errors; in columns 3 and 4 the errors are clustered at the individual level; $p-values$ are in brackets; * $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$

	High Raven Opp. Vote HG b/p	Low Raven Opp. Vote HG b/p	All Vote HG b/p	All Vote HG b/p
Raven Score (std)	0.06134***	–0.01986	–0.02232	–0.01775
	(0.0007)	(0.2581)	(0.1877)	(0.2999)
CRT Score (std)	0.01764	0.03144*	0.02703*	0.03035*
	(0.3158)	(0.0659)	(0.0983)	(0.0659)
High Raven Opp.			–0.01153	–0.11922**
			(0.5512)	(0.0193)
High Raven Opp.× Raven Score			0.09289***	0.08342***
			(0.0000)	(0.0003)
High Raven Opp.× CRT Score			–0.00640	–0.01364
			(0.7610)	(0.5223)
High Raven Opp.× Graduate				0.12887**
				(0.0288)
High Raven Opp.× Post-Graduate				0.14957**
				(0.0204)
High Raven Opp.× Further Secondary				0.08891
				(0.2530)
Post-Graduate	0.09036	–0.06496	0.00883	–0.05737
	(0.1017)	(0.1817)	(0.8221)	(0.2245)
Graduate	0.05355	–0.07995*	–0.02284	–0.07774*
	(0.2903)	(0.0655)	(0.5208)	(0.0674)
Further Secondary	–0.02806	–0.10723**	–0.07448*	–0.10941**
	(0.6625)	(0.0462)	(0.0893)	(0.0394)
Socio-Demographics	Yes	Yes	Yes	Yes
Previous PD Payoffs	Yes	Yes	Yes	Yes
Treatment Order	Yes	Yes	Yes	Yes
N	701	701	1402	1402

Table 7 also reveals interesting correlations with the educational variables. In particular, column 4 shows that the treatment (that is, the opponent's Raven Score) has a different effect on participants' behaviour depending on their education: participants with a graduate or post-graduate degree choose the HG at greater rates than participants with fewer years of education when facing a high ability opponent. This suggests that participants' education has an effect similar to their Raven Score in terms of predicting behavior, and independent from it.[10] This effect is interesting and policy relevant, a possibility is that education proxies or develops cognitive abilities not measured the Raven test or the CRT, another possibility is that education can train individual to think to indirect effects.

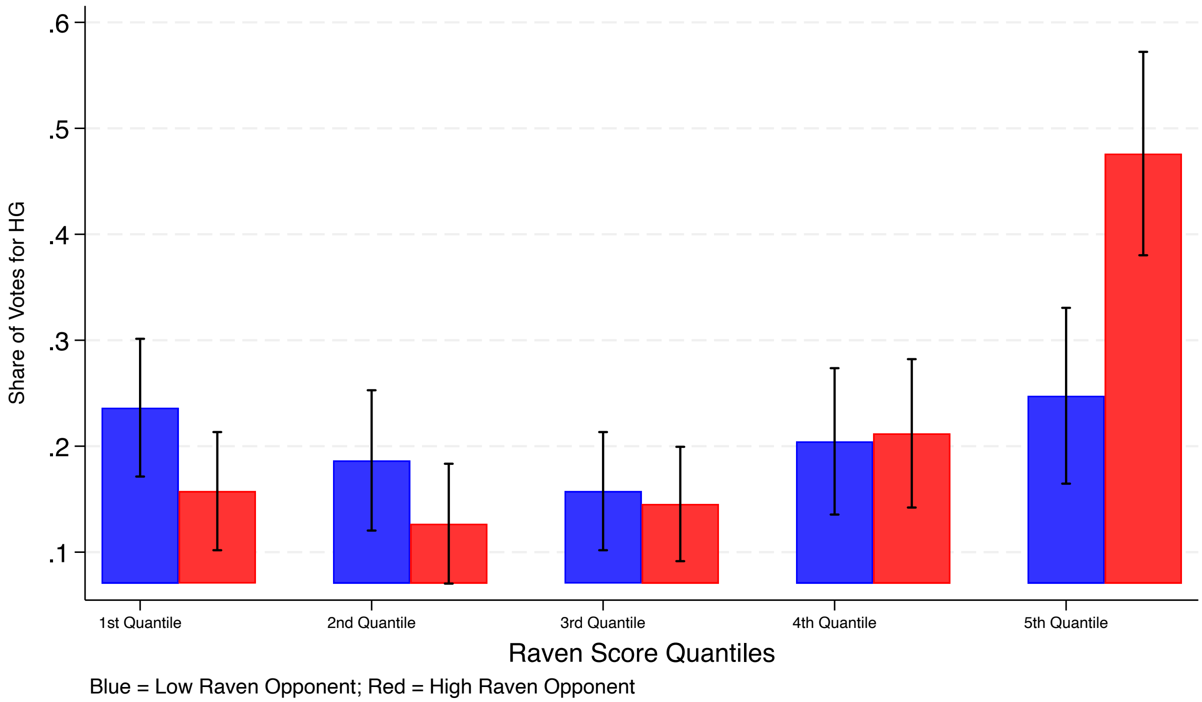
Additional analyses in Table A.9 of Appendix D show that the CRT Score is also a positive predictor of choosing the HG that also in this case we observe an heterogeneous treatment effect: the treatment has a stronger effect on participants with a greater CRT Score. When including as covariates both the Raven Score and the CRT Score, as in Table 7, only the coefficient of the former remains significantly different from zero. Raven Score is the only cognitive ability measure whose interaction with the treatment is stastically significant also when we perform this same analysis with a coarser Raven Score measure, calculated using only 6 matrices and thus more comparable with the CRT Score (see TableA.5). Finally, as robustness check, we show that our results continue to hold when we use only the Raven Score as measure of cognitive ability (see Table A.10).

We group our sample into five quantiles based on their Raven Score and calculate the proportion of participants who choose the HG over the PD for each quantile and for each treatment (i.e., High Raven Score opponent and Low Raven Score opponent). Figure 3 reveals two distinct patterns. First, there is a non-monotonic relationship between cognitive skills and preferences over games, with subjects at the two extremes of the distribution showing a stronger preference for the HG than those in the middle. This non-monotonicity is more rigorously tested in Table A.11 in the Appendix. Second, only participants in the highest Raven Score quantile exhibit a stronger preference for the HG when paired with a high-cognitive-skills opponent. On the contrary, participants in the lowest quantiles are more likely to choose the HG when paired with a low-cognitive-skills opponent.

Figure 4 delves deeper into the observed non-monotonicity between cognitive abilities

[10]For more information on the UK educational system and how to interpret our educational variables see footnote 6.

Figure 3: **Raven Scores and Preferences in the Two Treatments:** Each rectangle of the histogram represents the share of participants choosing the HG by quantiles of Raven Score in each of the two treatments (in blue and red). The bars represent the 95% confidence intervals.

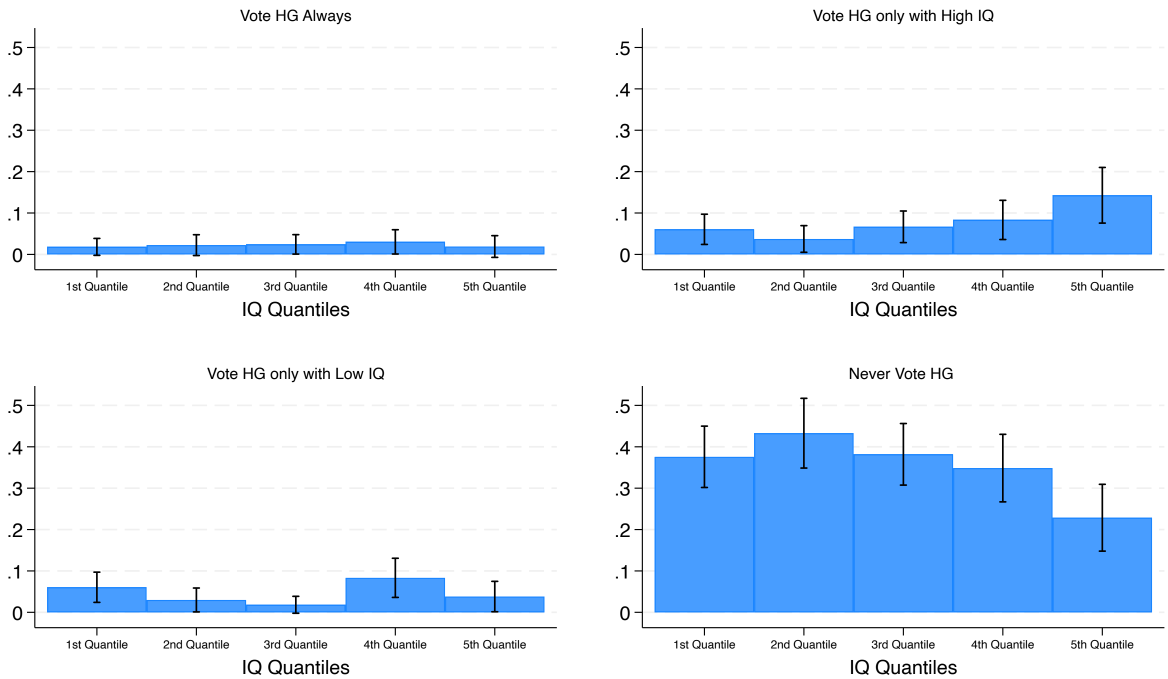


and preferences between games. Subjects in the lowest Raven Score quantile show a higher preference for the HG over those in the subsequent two quantiles, regardless of the cognitive abilities of their opponents.

4.3 Optimal Policy Based on Observed Behavior

From game theory, we know that when individuals are fully rational and rationality is common knowledge, the optimal behavior is to prefer the HG. However, does this preference still hold when players are not fully rational? In what follows, we address this question empirically. We calculated the expected payoffs using the actual frequencies of choices made by our subjects in each game, as presented in Table A.12 in the Appendix. These frequencies were treated as probabilities to compute the expected payoffs for both actions in both games,

Figure 4: **Raven Scores and Preferences by Strategies**



which we report in Tables 8 and 9.

Table 8 indicates that when facing a low-cognitive-skills opponent, the strategy that maximizes the expected payoff is to choose the PD, and then Defect in the resulting game. Conversely, Table 9 shows that when playing against a high-cognitive-skills opponent, the optimal strategy is to choose the HG and then Cooperate. From these calculations, we infer that subjects with higher cognitive abilities tend to play more profitably than those with lower abilities.

Table 8: **Estimated Expected Payoffs with Low IQ Opponent**

Vote/Choice	**HG**	**PD**
C	7.22	6.39
D	6.22	8.39

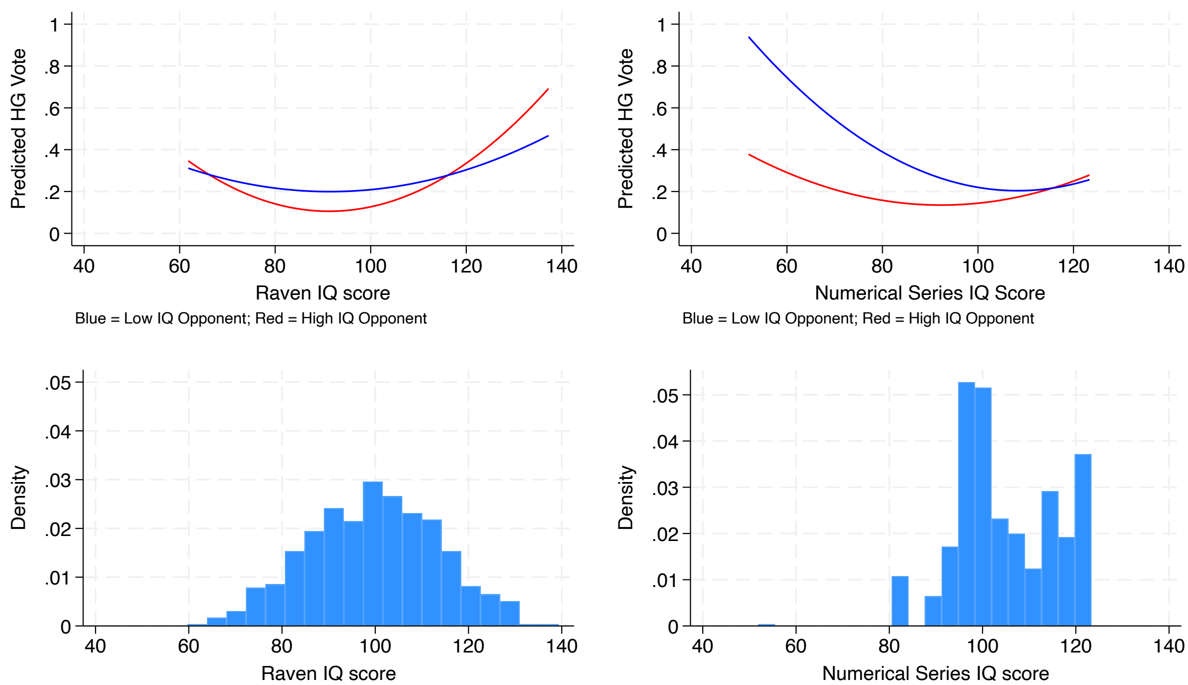
In the top left panel of Figure 5, we present the predicted probability of choosing the HG based on the IQ (calculated from Raven Scores as described above) for each of the two treatments, using the quadratic models estimated in Table A.11 in the Appendix. The

Table 9: **Estimated Expected Payoffs with High IQ Opponent**

Vote/Choice	HG	PD
C	8.00	4.58
D	7.00	6.58

intersection of the two lines occurs at an IQ of approximately 115, which can be considered the threshold above which subjects are more likely to exhibit behavior that maximizes their payoffs. The bottom right panel of Figure 5 shows the distribution of Raven-Based IQ among our subjects.

Figure 5: **Predicted Choice of Harmony Game**



The top right panel of Figure 5 displays the predicted choice of the HG using the Numerical-Series-Based IQ. Similar to the Raven-Based IQ predictions, the two lines intersect at an IQ of around 115. The Numerical-Series-Based IQ was calculated using data from the 2011 wave of the Understanding Society dataset (which, as usual, has been normalized with a mean of 100 and standard deviation of 15) and its distribution is presented in the bottom right panel of Figure 5.[11]

5 Measure of Appreciation of Indirect Effects

To understand better the process leading to an appreciation of the indirect effects of policies, in Part 6 of our study, we presented participants with two open-ended questions aimed at eliciting their views on the potential direct and indirect consequences of policy reforms in the UK. We asked our subjects the following two questions:

- Minimum Wage: *Recently, the UK has increased the hourly gross minimum wage from 10.42 GBP to 11.44 GBP for 21-year-olds and over. What do you think will be the consequences in the UK? Please respond in full sentences.*

- Immigration: *In the UK, on 1 January 2021, there were 9.5 million foreigners, representing 14.4% of the UK population. What do you think would be the consequences of reducing the inflow of foreigners to the UK with the goal of reaching the European average? Please respond in full sentences.*

With help from ChatGPT and a Research Assistant, we compiled a list of all the indirect consequences of each reform mentioned by our respondents in their answers. For this purpose, we define a consequence as indirect if it involves economic agents changing their behavior in response to the new policy. The list, separately for the minimum wage and the immigration question, is available in Section B of the Appendix. Endowed with these lists, we then manually coded the number of indirect consequences mentioned by each participant in each answer.

In Table A.1 of the Appendix, we present descriptive statistics for the main variables of this textual analysis; the variable "Left Leaning" corresponds to a self-assessment of one's

[11] The Numerical-Series-Based IQ features a less regular distribution than the Raven-Based IQ. As we mentioned above, the former measure is strictly influenced by the degree of individuals' numeracy, and for this reason, the latter measure is preferable.

Table 10: **Determinants of Listed Indirect Effects:** Dependent Variable: Number of Indirect Consequences Open Questions on Policies' Indirect Effects. Correlation with Cognitive Abilities. The mitted category for education is secondary or primary

	baseline		+Ideology		+Lenght	
	Immigration	Min.Wage	Immigration	Min.Wage	Immigration	Min.Wage
	b/se	b/se	b/se	b/se	b/se	b/se
Raven Score	–0.034	–0.023	–0.038	–0.016	–0.040*	–0.020
	(0.0267)	(0.0363)	(0.0267)	(0.0355)	(0.0243)	(0.0313)
CRT Score	0.127***	0.083**	0.124***	0.087**	0.078***	0.020
	(0.0268)	(0.0380)	(0.0265)	(0.0373)	(0.0245)	(0.0329)
Right Leaning			–0.038***	0.056***	–0.040***	0.051***
			(0.0126)	(0.0159)	(0.0115)	(0.0158)
Words Imm.					0.001***	
					(0.0001)	
Words Min. Wage						0.002***
						(0.0002)
Age	–0.003*	0.006***	–0.002	0.005**	–0.001	0.007***
	(0.0015)	(0.0021)	(0.0015)	(0.0021)	(0.0014)	(0.0019)
Female	0.006	–0.082	0.002	–0.075	–0.001	–0.085
	(0.0432)	(0.0597)	(0.0430)	(0.0593)	(0.0401)	(0.0546)
Income	0.001	–0.000	0.001	–0.000	0.001	0.000
	(0.0007)	(0.0009)	(0.0007)	(0.0009)	(0.0006)	(0.0008)
Post-Graduate	0.117	–0.011	0.094	0.023	0.072	–0.045
	(0.0716)	(0.1062)	(0.0718)	(0.1049)	(0.0664)	(0.0954)
Graduate	0.116*	0.122	0.103*	0.141	0.070	0.077
	(0.0597)	(0.0875)	(0.0593)	(0.0877)	(0.0561)	(0.0808)
Further Secondary	0.002	–0.100	–0.011	–0.080	–0.003	–0.052
	(0.0669)	(0.0967)	(0.0661)	(0.0965)	(0.0626)	(0.0925)
Constant	0.463***	0.631***	0.617***	0.405**	0.371***	–0.019
	(0.1034)	(0.1480)	(0.1101)	(0.1644)	(0.1011)	(0.1510)
N	701	701	701	701	701	701

own political ideology on a scale between 1 to 10, where 1 is extreme left. In Table A.2, we present the cross correlations between the main variables involved in this analysis. We note in particular that the CRT Score is significantly and positively correlated with the listed consequences, while the Raven Score is not significantly correlated. Furthermore, we find that Right Leaning is significantly and negatively correlated with the CRT Score.

We assumed that the number of untried policies' indirect effects identified by participants to be a measure of the respondents' degree of strategic sophistication or of their depth of understanding of the untried policies. We then used this measure as the dependent variable in the regression analyses shown in Table 10.

The results show that while the CRT Score is a significant predictor of the number of identified indirect effects, the Raven Score is not. The introduction of a measure of participants' political ideology (Right Leaning) does not seem to affect the former results suggesting that the number of indirect effects listed is not merely a consequence of one's own view on the proposed reform. At the same time, the coefficient of political ideology is statistically significant and the interpretation of the sign of the coefficients of this coefficient with respect to both dependent variables is very intuitive: more right-leaning individuals list less indirect consequences for immigration reform, probably because they assign more weight to the direct effect (e.g., a change in the number of foreigners in the country). On the contrary, more right-leaning respondents tend to list more indirect consequences of a minimum wage increase suggesting that here the left-leaning participants are more attentive to the direct consequences (e.g., higher wages for the poorer) and oblivious to the indirect ones (e.g., reduced labor demand or layoffs by entrepreneurs).

Result 3. *When prompted to describe the consequences of real-world (immigration and labor) policy reforms, participants with greater cognitive abilities (that is, with a greater CRT Score) are more likely to think of indirect effects.*

6 Conclusion

The research presented here considered the intricate interplay between cognitive abilities and political preferences, shedding light on a crucial aspect of economic and political science analysis. Our investigation focused on individuals' capacity to grasp the indirect effects of untested policies. Our model shows that one's own cognitive abilities alone and an understanding of the ultimate effects of policies do not guarantee support for welfare-enhancing reforms. Equally important is the belief in the cognitive competence of one's peers.

Our methodological approach was rich enough to consider the role of beliefs in behavior: we incorporated pre-registered experimental games to manipulate beliefs about others' cognitive abilities and complemented these with textual analysis. The results largely affirm our hypotheses but also unveil some surprising patterns. We discovered a non-monotonic relationship between cognitive abilities and the support for reform, with the responses to our treatments varying by subjects' cognitive capacity. These findings include an inverse effect for those with lower cognitive abilities.

We found that individuals with higher cognitive abilities are inclined to favor policies with beneficial indirect effects, in spite of seemingly costly direct and immediate effects; but this preference is contingent on their expectations of other voters' understanding of the overall consequences. Revisiting Table 1, which details the determinants of political preferences, we observe that in the 2010 UK elections, those with higher cognitive abilities were more prone to support the Liberal Democrats over the Conservatives and less likely to back Labour. Considering the 2010 UK general election context, where Labour was defeated after a 13-year tenure, it appears that voters with greater cognitive abilities were more inclined toward parties proposing novel policies, such as those proposed by the Conservatives or Liberal Democrats. Furthermore, the Liberal Democrats' market-oriented stance is also more likely to result in policies with significant indirect effects; for this reason, individuals with higher cognitive abilities could be in a better position to understand them.

The implications of our findings for public policy are potentially important. While the long-term impacts of early childhood interventions on cognitive development are still being assessed (e.g., Kautz et al., 2014), there is growing evidence suggesting that they can be successful in fostering cognitive skills (e.g. García and Heckman, 2023; Zhang et al., 2024).[12] Our results suggest an additional benefit of enhancing cognitive abilities: not only could individual economic prospects improve, but so might the quality of societal decision-making. Furthermore, the finding that individual education appears to have an effect that is similar to, but independent of, the cognitive abilities as measured by our tests highlights even more the role of education on the demand for optimal policies and offers an inspiration for future research.

[12]For example, considering two iconic programs: Perry Preschool increased cognition at age 54 by half of a standard deviation; Abecedarian Projects increased cognition at age 45 by one-third of a standard deviation (García and Heckman, 2023).

The influence of media consumption on cognitive abilities also warrants attention, with studies indicating a correlation between childhood exposure to entertainment TV and social media and reduced cognitive sophistication (Durante et al., 2019). Our study adds another layer to this dialogue by considering the wider societal repercussions.

Furthermore, our research underscores the vital role of trust in the democratic process. Trust here takes on a broader meaning, encompassing not only faith in the integrity and pro-social behavior of others but also in their rationality and ability to evaluate the long-run consequences of policies. Such trust is essential for the collective endorsement of policies that may be costly upfront but are likely to deliver long-term societal gains.

In summary, our work highlights the complex nexus between citizens' cognitive abilities, their trust in collective rationality, and the dynamics of support for public policies. It underscores the importance of promoting cognitive abilities and rational trust in others as collective objectives, with implications that extend beyond individual welfare to the health and efficacy of democratic institutions.

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A Appendix

A.1 Experimental Design: Timing Overview

Day 1: Measuring Cognitive Skills

- Part 1: 18 Raven's Advanced Progressive Matrices
- Part 2: Number Sequences Task (from Understanding Society)
- Part 3: 6-question Cognitive Reflection Test

Day 2: Measuring Understanding of Policies' Effects

- Part 4: behavior in exogenous games
  - 5 rounds of PD with 5 different opponents and feedback
  - 1 round of HG without feedback
- Part 5: 2 rounds with choice of PD or HG
  - Within-subject manipulation of opponent's intelligence
  - Subject learns opponent's score in Part 1 before choice
  - Treatments: high intelligence opponent (15/18 matrices solved correctly) versus low intelligence opponent (3/18)
- Part 6: open-ended questions about perceived consequences of raising minimum wage and reducing inflow of migrants

A.2 Experimental Design: Screenshots

Figure A.1: 5 Rounds of (Static) Prisoner's Dilemma with Feedback

Part 4, Interaction 1

The EPs you will receive in this interaction will depend on your choice and on the choice of Participant A.

The EPs Participant A received in this interaction depended on his/her choice and on the choice of Participant B.

When choosing, Participant A did not know Participant B's choice but saw the table on the right-hand side of your screen.

Your Choice	Participant A's Choice	Your Earnings
Action 1	Action 1	9
Action 2	Action 1	11
Action 1	Action 2	3
Action 2	Action 2	5

Participant A's Choice	Participant B's Choice	Participant A's Earnings
Action 1	Action 1	9
Action 2	Action 1	11
Action 1	Action 2	3
Action 2	Action 2	5

Please choose your action:

- Action 1
- Action 2

Figure A.2: 1 Round of Harmony Game without Feedback

Part 4, Interaction 6

The EPs you will receive in this interaction will depend on your choice and on the choice of Participant K.

The EPs Participant K received in this interaction depended on his/her choice and on the choice of Participant L.

When choosing, Participant K did not know Participant L's choice but saw the table on the right-hand side of your screen.

Your Choice	Participant K's Choice	Your Earnings
Action 1	Action 1	8
Action 2	Action 1	7
Action 1	Action 2	2
Action 2	Action 2	1

Participant K's Choice	Participant L's Choice	Participant K's Earnings
Action 1	Action 1	8
Action 2	Action 1	7
Action 1	Action 2	2
Action 2	Action 2	1

Please choose your action:

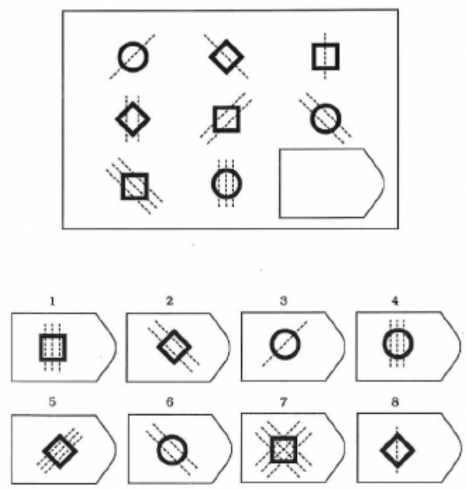
- ◯ Action 1
- ◯ Action 2

Figure A.3: Experimental Manipulation of Opponent's Intelligence

There are two important differences with respect to Part 4.

First, before each interaction, you will learn the other participants' performance in the 18 puzzles you solved yesterday.

Just to remind you, this is one of those puzzles:



These puzzles are Raven's Matrices and, according to Wikipedia, they are *"a non-verbal test typically used to measure general human intelligence and abstract reasoning and is regarded as a non-verbal estimate of fluid intelligence"*.

Figure A.4: Game Choice with High Intelligence Opponent

Part 5, Interaction 1: Choose Table of Earnings

In Interaction 1, your earnings depend on your choice and on the choice of another participant, Participant K.

Participant K solved **15 out of 18** Raven's Matrices correctly.

Participants' performance ranged from 0 to 18 matrices solved correctly with an average of 9.

Participant K participated in two interactions, one using the Original Table of Earnings and one using the Alternative Table of Earnings. You can choose what tables of earnings to use for this interaction. Your choice determines (a) what table of earnings we use to determine your EPs depending on your choice and on Participant K's choice and (b) whether we use Participant K's choice in their interaction using the Original Table of Earnings or in their interaction using the Alternative Table of Earnings.

Original Tables of Earnings

Your Choice	Participant K's Choice	Your Earnings
Action 1	Action 1	9
Action 2	Action 1	11
Action 1	Action 2	3
Action 2	Action 2	5

Participant K's Choice	Participant L's Choice	Participant K's Earnings
Action 1	Action 1	9
Action 2	Action 1	11
Action 1	Action 2	3
Action 2	Action 2	5

Alternative Tables of Earnings

Your Choice	Participant K's Choice	Your Earnings
Action 1	Action 1	8
Action 2	Action 1	7
Action 1	Action 2	2
Action 2	Action 2	1

Participant K's Choice	Participant L's Choice	Participant K's Earnings
Action 1	Action 1	8
Action 2	Action 1	7
Action 1	Action 2	2
Action 2	Action 2	1

What tables of earnings do you choose for this interaction?

- ○ Original Tables of Earnings
- ○ Alternative Tables of Earnings

Figure A.5: Game Choice with Low Intelligence Opponent

Part 5, Interaction 2: Choose Table of Earnings

In Interaction 2, your earnings depend on your choice and on the choice of another participant, Participant M.

Participant M solved **3 out of 18** Raven's Matrices correctly.

Participants' performance ranged from 0 to 18 matrices solved correctly with an average of 9.

Participant M participated in two interactions, one using the Original Table of Earnings and one using the Alternative Table of Earnings. You can choose what tables of earnings to use for this interaction. Your choice determines (a) what table of earnings we use to determine your EPs depending on your choice and on Participant M's choice and (b) whether we use Participant M's choice in their interaction using the Original Table of Earnings or in their interaction using the Alternative Table of Earnings.

Original Tables of Earnings

Your Choice	Participant M's Choice	Your Earnings
Action 1	Action 1	9
Action 2	Action 1	11
Action 1	Action 2	3
Action 2	Action 2	5

Participant M's Choice	Participant O's Choice	Participant M's Earnings
Action 1	Action 1	9
Action 2	Action 1	11
Action 1	Action 2	3
Action 2	Action 2	5

Alternative Tables of Earnings

Your Choice	Participant M's Choice	Your Earnings
Action 1	Action 1	8
Action 2	Action 1	7
Action 1	Action 2	2
Action 2	Action 2	1

Participant M's Choice	Participant O's Choice	Participant M's Earnings
Action 1	Action 1	8
Action 2	Action 1	7
Action 1	Action 2	2
Action 2	Action 2	1

What tables of earnings do you choose for this interaction?

- ◯ Original Tables of Earnings
- ◯ Alternative Tables of Earnings

B Indirect Consequences Identified by Respondents

Indirect Consequences of Minimum Wage Reform

1. Increase in workers' consumption
2. Inflation
3. Greater inward migration to UK
4. Greater unemployment (due to, e.g., outsourcing)
5. Change in employers' recruiting strategy
6. Change in citizens' political behavior
7. Reduced reliance on government benefits
8. Increase in illegal labor agreements
9. Businesses closing
10. Greater workers' productivity

Indirect Consequences of Immigration Reform

1. UK nationals entering labor force, reduced reliance on government benefits, increased quality of public services
2. Reduction in quantity of goods and services produced
3. Reduction in quality of goods and services produced
4. Greater outward migration from the UK
5. Greater public spending on border and immigration control
6. Greater investment in human capital of UK nationals

7. Greater wages for workers, greater costs for entrepreneurs

8. Businesses closing

9. Reduced CO2 emissions due to fewer houses being built

C Descriptive Statistics of Textual Analysis

Table A.1: Textual Analysis

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Imm. Conseq.	0.441	0.574	0	3	701
Min. Wage Conseq.	0.906	0.802	0	5	701
Words in Min. Wage	204.545	176.307	7	2284	701
Words in Imm.	222.913	195.075	12	2953	701
Right Leaning	4.738	1.903	1	10	701

Table A.2: Correlations

Variables	Imm. Conseq.	Min. Wage Conseq.	Raven Score	CRT Score	Right Leaning
Imm. Conseq.	1.000				
Min. Wage Conseq.	0.221	1.000			
	(0.000)				
Raven Score	0.088	0.015	1.000		
	(0.020)	(0.701)			
CRT Score	0.215	0.119	0.472	1.000	
	(0.000)	(0.002)	(0.000)		
Right Leaning	-0.150	0.148	-0.117	-0.059	1.000
	(0.000)	(0.000)	(0.002)	(0.120)	

D Supplementary Analysis

Table A.3: **Correlations between Cognitive Skills and Education** The omitted category is Primary or Secondarr; $p\text{−}values$ are in brackets; * $p\text{−}value < 0.1$, ** $p\text{−}value < 0.05$, *** $p - value < 0.01$

	Raven	Raven 6	CRT	Num.Series
	b/p	b/p	b/p	b/p
Post-Graduate	2.6739***	0.8779***	1.1948***	9.9380***
	(0.0000)	(0.0000)	(0.0000)	(0.0004)
Graduate	1.6365***	0.5205***	0.7720***	10.3678***
	(0.0000)	(0.0015)	(0.0000)	(0.0000)
Further Secondary	0.5380	0.0323	0.0915	6.0263**
	(0.1988)	(0.8684)	(0.6718)	(0.0432)
N	701	701	701	701

Table A.4: **Effect of Cognitive Skills on Cooperative Behaviour with Visible Controls' Coefficients:** The binomial dependent variable is the action Default. CRT and Raven scores are standardized. The omitted category of education is Secondary and Primary. The coefficients represent the marginal effect and are calculated using a logit estimator. Robust Standard Errors; $p-values$ are in brackets; * $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$

	Prisoners' Dilemma					Harmony Game
	Round 1	Round 2	Round 3	Round 4	Round 5	Round 1
	b/p	b/p	b/p	b/p	b/p	b/p
Raven Score (std)	0.03604*	0.06066***	0.06940***	0.09286***	0.06773***	–0.02298*
	(0.0695)	(0.0017)	(0.0005)	(0.0000)	(0.0006)	(0.0546)
CRT Score (std)	–0.01212	–0.03623*	0.01802	–0.01393	–0.02049	–0.03739***
	(0.5518)	(0.0685)	(0.3627)	(0.4779)	(0.3165)	(0.0035)
Income	0.00010	–0.00013	–0.00034	–0.00082	0.00058	0.00008
	(0.8550)	(0.8076)	(0.5080)	(0.1125)	(0.2771)	(0.7727)
Female	0.01102	–0.00906	0.02415	–0.05064	0.02274	–0.06172***
	(0.7528)	(0.7947)	(0.4856)	(0.1384)	(0.5204)	(0.0050)
Age	0.01020	–0.00313	0.01103	0.01189*	0.01429*	–0.00264
	(0.1596)	(0.6664)	(0.1258)	(0.0980)	(0.0526)	(0.5497)
Age Squared	–0.00008	0.00004	–0.00009	–0.00014*	–0.00014*	0.00002
	(0.2651)	(0.6063)	(0.2115)	(0.0659)	(0.0687)	(0.6196)
Post-Graduate	–0.01173	0.09655*	–0.02112	–0.03606	–0.02589	–0.05340
	(0.8501)	(0.0875)	(0.7249)	(0.5466)	(0.6695)	(0.1192)
Graduate	–0.05325	0.09556**	–0.03826	–0.05114	–0.02471	–0.04919*
	(0.3086)	(0.0430)	(0.4569)	(0.3085)	(0.6272)	(0.0851)
Further Secondary	–0.02314	0.09082	0.00114	–0.07813	–0.04938	–0.03585
	(0.7039)	(0.1006)	(0.9847)	(0.1734)	(0.3970)	(0.2658)
Sum of Previous Payoffs		0.01559***				
		(0.0027)				
Sum of Previous Payoffs			0.01333***			
			(0.0005)			
Sum of Previous Payoffs				0.00729**		
				(0.0259)		
Sum of Previous Payoffs					0.00965***	
					(0.0010)	
Sum of Previous Payoffs						–0.00636***
						(0.0008)
N	701	701	701	701	701	701

Table A.5: **Effect of Cognitive Skills on Cooperative Behaviour with 6 items raven score:** The binomial dependent variable is the action Default. CRT and Raven scores are standardized. The omitted category of education is Secondary and Primary. The coefficients represent the marginal effect and are calculated using a logit estimator. Robust Standard Errors; $p-values$ are in brackets; * $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$

	Prisoners' Dilemma					Harmony Game
	Round 1	Round 2	Round 3	Round 4	Round 5	Round 1
	b/p	b/p	b/p	b/p	b/p	b/p
Raven Score 6 items (std)	0.02560	0.05282***	0.05756***	0.05650***	0.03912**	–0.01747
	(0.1708)	(0.0027)	(0.0023)	(0.0020)	(0.0398)	(0.1612)
CRT Score (std)	–0.00612	–0.03011	0.02653	0.00528	–0.00566	–0.04082***
	(0.7563)	(0.1215)	(0.1684)	(0.7854)	(0.7776)	(0.0019)
Income	0.00015	–0.00009	–0.00028	–0.00067	0.00069	0.00005
	(0.7992)	(0.8698)	(0.5849)	(0.2013)	(0.1964)	(0.8596)
Female	0.00949	–0.01248	0.02049	–0.05462	0.01986	–0.06015***
	(0.7864)	(0.7193)	(0.5541)	(0.1118)	(0.5769)	(0.0061)
Age	0.01053	–0.00243	0.01173	0.01286*	0.01497**	–0.00286
	(0.1485)	(0.7369)	(0.1049)	(0.0739)	(0.0408)	(0.5152)
Age Squared	–0.00009	0.00003	–0.00011	–0.00015**	–0.00015**	0.00003
	(0.2384)	(0.6981)	(0.1667)	(0.0399)	(0.0462)	(0.5642)
Post-Graduate	–0.00484	0.10692*	–0.00913	–0.01702	–0.01152	–0.05734*
	(0.9377)	(0.0573)	(0.8784)	(0.7766)	(0.8487)	(0.0954)
Graduate	–0.04858	0.10211**	–0.03038	–0.03785	–0.01480	–0.05099*
	(0.3515)	(0.0301)	(0.5537)	(0.4518)	(0.7712)	(0.0736)
Further Secondary	–0.01966	0.09760*	0.00862	–0.07011	–0.04391	–0.03684
	(0.7463)	(0.0787)	(0.8840)	(0.2254)	(0.4535)	(0.2577)
Sum of Previous Payoffs		0.01557***				
		(0.0027)				
Sum of Previous Payoffs			0.01356***			
			(0.0004)			
Sum of Previous Payoffs				0.00781**		
				(0.0178)		
Sum of Previous Payoffs					0.00996***	
					(0.0007)	
Sum of Previous Payoffs						–0.00646***
						(0.0006)
N	701	701	701	701	701	701

Table A.6: **Effect of CRT on Cooperative Behaviour:** The binomial dependent variable is the action Default. CRT score is standardized. The omitted category of education is Secondary and Primary. The coefficients represent the marginal effect and are calculated using a logit estimator. Robust Standard Errors; $p-values$ are in brackets; * $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$

	Prisoners' Dilemma					Harmony Game
	Round 1	Round 2	Round 3	Round 4	Round 5	Round 1
	b/p	b/p	b/p	b/p	b/p	b/p
CRT Score (std)	0.00350	–0.01063	0.04822***	0.02696	0.00897	–0.04707***
	(0.8490)	(0.5653)	(0.0083)	(0.1273)	(0.6266)	(0.0001)
Income	0.00022	0.00007	–0.00011	–0.00052	0.00081	0.00001
	(0.6994)	(0.8939)	(0.8316)	(0.3226)	(0.1273)	(0.9793)
Female	0.01045	–0.01155	0.02198	–0.05261	0.02147	–0.05940***
	(0.7654)	(0.7412)	(0.5279)	(0.1278)	(0.5470)	(0.0067)
Age	0.01053	–0.00250	0.01171	0.01285*	0.01497**	–0.00284
	(0.1494)	(0.7310)	(0.1082)	(0.0762)	(0.0419)	(0.5178)
Age Squared	–0.00009	0.00003	–0.00011	–0.00016**	–0.00015**	0.00003
	(0.2309)	(0.7245)	(0.1548)	(0.0364)	(0.0434)	(0.5479)
Post-Graduate	–0.00063	0.11656**	0.00070	–0.00729	–0.00577	–0.06006*
	(0.9919)	(0.0398)	(0.9907)	(0.9031)	(0.9232)	(0.0848)
Graduate	–0.04637	0.10862**	–0.02560	–0.03208	–0.01160	–0.05148*
	(0.3751)	(0.0221)	(0.6192)	(0.5224)	(0.8194)	(0.0733)
Further Secondary	–0.02203	0.09464*	0.00283	–0.07441	–0.04737	–0.03402
	(0.7181)	(0.0925)	(0.9623)	(0.1968)	(0.4203)	(0.2873)
Sum of Previous Payoffs		0.01539***				
		(0.0031)				
Sum of Previous Payoffs			0.01366***			
			(0.0004)			
Sum of Previous Payoffs				0.00805**		
				(0.0153)		
Sum of Previous Payoffs					0.01012***	
					(0.0006)	
Sum of Previous Payoffs						–0.00654***
						(0.0005)
N	701	701	701	701	701	701

Table A.7: **Effect of Raven on Cooperative Behaviour:** The binomial dependent variable is the action Default. Raven score is standardized. The omitted category of education is Secondary and Primary. The coefficients represent the marginal effect and are calculated using a logit estimator. Robust Standard Errors; $p-values$ are in brackets; * $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$

	Prisoners' Dilemma					Harmony Game
	Round 1	Round 2	Round 3	Round 4	Round 5	Round 1
	b/p	b/p	b/p	b/p	b/p	b/p
Raven Score (std)	0.03084*	0.04550**	0.07719***	0.08683***	0.05893***	–0.03844***
	(0.0848)	(0.0110)	(0.0000)	(0.0000)	(0.0008)	(0.0004)
Income	0.00008	–0.00019	–0.00031	–0.00084	0.00054	–0.00000
	(0.8847)	(0.7235)	(0.5484)	(0.1026)	(0.3068)	(0.9902)
Female	0.01451	0.00153	0.01904	–0.04644	0.02875	–0.05168**
	(0.6734)	(0.9644)	(0.5791)	(0.1686)	(0.4051)	(0.0172)
Age	0.01037	–0.00243	0.01071	0.01211*	0.01460**	–0.00172
	(0.1532)	(0.7365)	(0.1373)	(0.0917)	(0.0483)	(0.7079)
Age Squared	–0.00009	0.00003	–0.00009	–0.00014*	–0.00015*	0.00001
	(0.2479)	(0.7107)	(0.2383)	(0.0581)	(0.0587)	(0.8536)
Post-Graduate	–0.01656	0.08142	–0.01431	–0.04138	–0.03391	–0.06459*
	(0.7871)	(0.1439)	(0.8102)	(0.4842)	(0.5697)	(0.0579)
Graduate	–0.05641	0.08618*	–0.03399	–0.05428	–0.02950	–0.05456*
	(0.2782)	(0.0662)	(0.5070)	(0.2765)	(0.5591)	(0.0560)
Further Secondary	–0.02354	0.09095	0.00097	–0.07799	–0.04939	–0.03346
	(0.6984)	(0.1007)	(0.9869)	(0.1729)	(0.3972)	(0.3075)
Sum of Previous Payoffs		0.01546***				
		(0.0030)				
Sum of Previous Payoffs			0.01322***			
			(0.0005)			
Sum of Previous Payoffs				0.00728**		
				(0.0260)		
Sum of Previous Payoffs					0.00964***	
					(0.0010)	
Sum of Previous Payoffs						–0.00632***
						(0.0008)
N	701	701	701	701	701	701

Table A.8: **Effect of Own Cognitive Abilities and Partners' Cognitive Abilities on Game Preferences using 6 items Raven Score:** The binomial dependent variable is the vote for the HG. CRT score is standardized. The omitted education category is secondary or primary education. The interacted term Graduate+ indicates subjects with an Undergraduate and Postgraduate degree. Socio-Demographics controls include: Age, Age sq., Gender and Income. The coefficients represent the marginal effect and are calculated using a logit estimator. Robust Standard Errors; in columns 3 and 4 the errors are clustered at the individual level; $p-values$ are in brackets; * $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$

	High Raven Opp. Vote HG b/p	Low Raven Opp. Vote HG b/p	All Vote HG b/p	All Vote HG b/p
Raven Score 6 items (std)	0.04403***	–0.02713*	–0.03080**	–0.02762*
	(0.0077)	(0.0858)	(0.0479)	(0.0762)
CRT Score (std)	0.02808*	0.03299**	0.02843*	0.03325**
	(0.0922)	(0.0491)	(0.0781)	(0.0419)
High Raven Opp.			–0.00716	–0.12748**
			(0.7108)	(0.0118)
High Raven Opp.× Raven Score 6 items			0.08050***	0.07414***
			(0.0001)	(0.0003)
High Raven Opp.× CRT Score			0.00474	–0.00552
			(0.8136)	(0.7882)
High Raven Opp.× Graduate				0.14113**
				(0.0158)
High Raven Opp.× Post-Graduate				0.16792***
				(0.0083)
High Raven Opp.× Further Secondary				0.10270
				(0.1828)
Post-Graduate	0.10353*	–0.06748	0.01468	–0.06074
	(0.0605)	(0.1615)	(0.7072)	(0.1955)
Graduate	0.06253	–0.08093*	–0.01902	–0.07993*
	(0.2180)	(0.0606)	(0.5927)	(0.0598)
Further Secondary	–0.02008	–0.11037**	–0.07269*	–0.11416**
	(0.7538)	(0.0402)	(0.0972)	(0.0324)
Socio-Demographics	Yes	Yes	Yes	Yes
Previous PD Payoffs	Yes	Yes	Yes	Yes
Treatment Order	Yes	Yes	Yes	Yes
N	701	701	1402	1402

Table A.9: **Effect of CRT Score and Partners' Cognitive Skills on Game Preferences:** The binomial dependent variable is the vote for the HG. CRT score is standardized. The omitted education category is secondary or primary education. The interacted term Graduate+ indicates subjects with an Undergraduate and Postgraduate degree. Socio-Demographics controls include: Age, Age sq., Gender and Income. The coefficients represent the marginal effect and are calculated using a logit estimator. Robust Standard Errors; in columns 3 and 4 the errors are clustered at the individual level; $p-values$ are in brackets; * $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$

	High Raven Opp.	Low Raven Opp.	All	All
	Vote HG	Vote HG	Vote HG	Vote HG
	b/p	b/p	b/p	b/p
CRT Score (std)	0.04430***	0.02290	0.01607	0.02324
	(0.0057)	(0.1556)	(0.3025)	(0.1428)
High Raven Opp.			–0.00286	–0.13719***
			(0.8818)	(0.0063)
High Raven Opp.× CRT Score			0.03636*	0.02144
			(0.0644)	(0.2899)
High Raven Opp.× Graduate				0.15548***
				(0.0075)
High Raven Opp.× Post-Graduate				0.19294***
				(0.0021)
High Raven Opp.× Further Secondary				0.10812
				(0.1588)
Post-Graduate	0.11191**	–0.07128	0.01672	–0.07138
	(0.0430)	(0.1341)	(0.6682)	(0.1252)
Graduate	0.06734	–0.08428**	–0.01875	–0.08680**
	(0.1873)	(0.0480)	(0.5984)	(0.0404)
Further Secondary	–0.02106	–0.10875**	–0.07168	–0.11606**
	(0.7437)	(0.0424)	(0.1026)	(0.0308)
Socio-Demographics	Yes	Yes	Yes	Yes
Previous PD Payoffs	Yes	Yes	Yes	Yes
Treatment Order	Yes	Yes	Yes	Yes
N	701	701	1402	1402

Table A.10: **Effect of Raven Score and Partners' Cognitive Skills on Game Preferences:** The binomial dependent variable is the vote for the HG. Raven score is standardized. The omitted education category is secondary or primary education. The interacted term Graduate+ indicates subjects with an Undergraduate and Postgraduate degree. Socio-Demographics controls include: Age, Age sq., Gender and Income. The coefficients represent the marginal effect and are calculated using a logit estimator. Robust Standard Errors; in columns 3 and 4 the errors are clustered at the individual level; $p-values$ are in brackets; * $p-value < 0.1$, ** $p-value < 0.05$, *** $p-value < 0.01$

	High Raven Opp. Vote HG b/p	Low Raven Opp. Vote HG b/p	All Vote HG b/p	All Vote HG b/p
Raven Score (std)	0.06928***	–0.00638	–0.01055	–0.00472
	(0.0000)	(0.7026)	(0.5090)	(0.7719)
High Raven Opp.			–0.01198	–0.11826**
			(0.5340)	(0.0196)
High Raven Opp.× Raven Score			0.09041***	0.07814***
			(0.0000)	(0.0003)
High Raven Opp.× Graduate				0.12693**
				(0.0295)
High Raven Opp.× Post-Graduate				0.14497**
				(0.0229)
High Raven Opp.× Further Secondary				0.08989
				(0.2476)
Post-Graduate	0.09747*	–0.05251	0.01842	–0.04538
	(0.0726)	(0.2749)	(0.6356)	(0.3313)
Graduate	0.05868	–0.07296*	–0.01627	–0.07023*
	(0.2418)	(0.0892)	(0.6453)	(0.0949)
Further Secondary	–0.02721	–0.10813**	–0.07405*	–0.10939**
	(0.6718)	(0.0441)	(0.0913)	(0.0389)
Socio-Demographics	Yes	Yes	Yes	Yes
Previous PD Payoffs	Yes	Yes	Yes	Yes
Treatment Order	Yes	Yes	Yes	Yes
N	701	701	1402	1402

Table A.11: **Effect of Raven Score over Game Preferences in a quadratic model:** The binomial dependent variable is the vote for the HG. Raven score is standardized. Socio-Demographics controls include: Age, Age sq., Gender, Income and Education. The coefficients represent the marginal effect and are calculated using a logit estimator. The coefficients represent the marginal effects and are calculated using a logit estimator;. Robust Standard Errors; in columns 3 the errors are clustered at the individual level; $p - values$ are in brackets; * $p - value < 0.1$, ** $p - value < 0.05$, *** $p - value < 0.01$

	High Raven Opp.	Low Raven Opp.	All
	Vote HG	Vote HG	Vote HG
	b/p	b/p	b/p
Raven Score	–0.04988***	–0.03345*	–0.03584**
	(0.0037)	(0.0616)	(0.0415)
Raven Score^2	0.00371***	0.00176*	0.00182*
	(0.0000)	(0.0684)	(0.0549)
High Raven Opp.			–0.06764
			(0.4712)
High Raven Opp.$\times$ Raven Score			–0.01553
			(0.4711)
High Raven Opp.$\times$ Raven Score^2			0.00214*
			(0.0709)
Socio-Demographics	Yes	Yes	Yes
Previous PD Payoffs	Yes	Yes	Yes
Treatment Order	Yes	Yes	Yes
N	701	701	1402

Table A.12: **Frequency of Cooperation for Different Opponents.** The cooperation rates are computed for the 5^{th} round of PD (fifth interaction number 5 among the participants) and to the 1^{st} round of HG (or interaction 6)

Subjects	**Low Raven (=3)**	**High Raven (= 15)**
% Cooperation in PD	0.565	0.263
% Cooperation in HG	0.869	1

Figure A.6: **Raven Scores and Preferences in the Two Treatments by Education:** Each rectangle of the histogram represents the share of the vote for the HG by Education in each of the two treatments (in blue and red). The bars represent the 95% confidence intervals