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# Preferences predict who commits crime among young men

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**Understanding who commits crime and why is a key topic in social science and important for the design of crime prevention policy. In theory, people who commit crime face different social and economic incentives for criminal activity than other people, or they evaluate the costs and benefits of crime differently because they have different preferences. Empirical evidence on the role of preferences is scarce. Theoretically, risk-tolerant, impatient, and self-interested people are more prone to commit crime than risk-averse, patient, and altruistic people. We test these predictions with a unique combination of data where we use incentivized experiments to elicit the preferences of young men and link these experimental data to their criminal records. In addition, our data allow us to control extensively for other characteristics such as cognitive skills, socioeconomic background, and self-control problems. We find that preferences are strongly associated with actual criminal behavior. Impatience and, in particular, risk tolerance are still strong predictors when we include the full battery of controls. Crime propensities are 8 to 10 percentage points higher for the most risk-tolerant individuals compared to the most risk averse. This effect is half the size of the effect of cognitive skills, which is known to be a very strong predictor of criminal behavior. Looking into different types of crime, we find that preferences significantly predict property offenses, while self-control problems significantly predict violent, drug, and sexual offenses.**

crime | risk preference | time preference | self-control | altruism

In choice theory of crime, individuals trade off their benefits from criminal activity against the opportunity costs of legitimate activity and the risks of future costs due to apprehension and punishment (1–3). People can face different trade-offs, for instance, due to differences in how much they can otherwise earn in the labor market, or they can evaluate the trade-offs differently due to differences in preferences. A large empirical literature documents that variation in the trade-off people face predicts who commits crime (3–6). In contrast, little is known about the role of preferences.

Key preference parameters are risk tolerance and impatience. Intuitively, crime provides a benefit now but at the risk of a cost in the future which makes crime less attractive for people who dislike risk and care more about future well-being (3). Thus, more risk-tolerant and more impatient people are more prone to commit crime than others (see *SI Appendix, SI Text*, for a formal derivation in a basic model of criminal behavior). In standard choice theory, people are entirely driven by self-interest, but the theory can be extended to allow for altruistic motives or more sophisticated, other-regarding preferences (7–9). More altruistic people will commit less crime because they care about the costs they inflict on others.

In this paper, we ask whether preferences predict who commits crime among young men. We focus on young men (age 18 to 19) who are known to have much higher crime rates than women and

older people (3, 10, 11). To answer the question, we leverage a unique combination of data where we use incentivized experiments to elicit the preferences of young men in Denmark and link this experimental data to administrative records with information about all criminal offenses.

We examine the association between preferences and crime while also controlling for other differences across people that can explain criminal behavior. The link between experimental data and administrative records enables us to include an extraordinary rich set of relevant control variables. This includes school performance, area of residence, immigrant status, family size, birth order, parental socioeconomic status, criminal records of parents, and family stress as measured by parental divorce or unemployment. Moreover, when we collected the experimental data on preferences, we also asked about self-control which is known to be a strong predictor of crime (12–14). We use this information to control for behavioral factors other than risk, time, and social preferences. We also investigate the relation between preferences and different types of criminal offenses. Arguably, the hypothesis that cost-benefit considerations help explain crime seems more appropriate for property crimes than violent, drug, and sexual offenses where lack of self-control may be a more important driver.

## Significance

**Who commits crime? Theoretically, risk-tolerant and impatient people are more likely to commit crime because they care less about the risks of apprehension and punishment. By linking experimental data on risk tolerance and impatience of young men to administrative crime records, we find empirical support for this hypothesis. For example, crime rates are 8 to 10 percentage points higher for the most risk-tolerant people compared to the most risk averse. A theoretical implication is that those who are most prone to commit crime are also those who are least responsive to stricter law enforcement. Risk tolerance and impatience significantly predict property crime, while self-control is a stronger predictor of crimes of passion (violent, drug, and sexual offenses).**

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The authors declare no competing interest.

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This study links experimentally elicited risk, time, and social preferences to actual criminal behavior. We follow a large literature in experimental economics that elicits people's preferences using incentivized choice experiments, where participants receive payments according to their decisions in the experiment. This literature documents pervasive variation in preferences including that some people are more risk tolerant, impatient, and motivated by self-interest than others (15–17). Studies also show that these parameters are correlated with real-life behavior and outcomes in accordance with theoretical predictions, for example, savings, high school graduation, disciplinary referrals of school children, entrepreneurship, body mass index, and smoking (18–25). The number of participants in our elicitation experiment is large compared to previous studies, and the participants are sampled randomly from the population in contrast to many previous studies which are based on samples of students (26). A large population sample is important for our purpose because crime frequency is low and because students differ significantly from the population at large with respect to their crime propensity.

Most closely related to our work is a recent study that finds a significant relationship between patience and criminal offenses (27). The study uses a nonincentivized survey question to measure patience and demonstrates that this predicts crime. Interestingly, the authors find that the predictive power of patience is about one-third of the power of cognitive skills and that patience is most predictive of property crime, which is similar to our findings. Our study differs 1) by providing a more comprehensive and experimentally elicited set of preference measures that include risk preferences and social preferences and 2) by including a self-control measure in the set of predictors. This enables us to 1) show that risk tolerance is the strongest predictor of crime among the preference parameters and 2) document that risk and time preferences significantly predict property crime where self-control is not a significant predictor, whereas in the domain of violent, drug, and sexual offenses, self-control is a key predictor, while risk and time preferences are not significantly predictive.

## Materials and Methods

Based on a random sample provided from population registries by Statistics Denmark, we conducted an online incentivized preference elicitation experiment among 18- to 19-year-old individuals in Denmark in 2018. We invited 13,799 individuals to participate, who all received a personalized letter from the University of Copenhagen inviting them to participate on a customized internet platform. The invitations were distributed through an electronic mailbox (Digital Post), which is the default way to receive mail from public authorities in Denmark. Previous research suggests that response rates are

higher when contacting a random sample of potential respondents in this way compared to sending out physical invitation letters (28). In our case, 39% of the invited individuals logged on to the platform.

For the elicitation of each preference parameter, the participants were presented a series of choice situations, resembling methods previously used in the literature. Before making decisions in these choice situations, participants watched an animated instruction video and completed a tutorial session. The choice situations were presented in random order. Each choice situation involved a monetary trade-off, and toward the end of the session, one choice situation was randomly selected to be paid out. The average payment to participants was DKK 250 (USD 40). After the random selection, participants typed their cell number, and the money was then transferred through Mobile Pay, a Danish app used for fast transfer of money.

We used a money-earlier-or-later task (25) with 16 choice situations to elicit time preferences. Fig. 1A shows a screen shot of one of the choice situations in the time preference task. In this choice situation, an individual could choose to get DKK 250 paid out in 8 wk or to save all or some of the money for later and receive the savings plus an interest rate of 2.4% in 16 wk. In this example, the individual chose to save DKK 100 corresponding to a savings rate of 40% (100/250). This gave a payout of DKK 150 in 8 wk and a payout of DKK 102.4 in 16 wk. The rate of return and the time profile varied across the choice situations (SI Appendix, Table S6). We compute the mean savings rate across the choice situations of each individual and then use this measure to rank people on a 1 to 100 scale, corresponding to their percentile positions in the distribution of elicited impatience. The degree of impatience may be computed in more sophisticated ways, e.g., by estimating a structural model, but as we show, this does not change the results since the rank position of an individual is quite robust to different ways of computing impatience from the experiment (SI Appendix, Table S4).

The elicitation of risk preferences is based on an investment task (29) with 15 choice situations. Fig. 1B shows a screen shot for one of the situations. Here an individual could choose to get DKK 250 with certainty or invest some or all of the money in a lottery which yielded an average rate of return of 6%, with the risk of a significant loss. In this example, the individual chose to keep DKK 50 and invest DKK 200 in the lottery, corresponding to an investment of 80% of the initial DKK 250 endowment. The investment gave DKK 80 (a loss) with a probability of 40% and DKK 300 (a win) with a probability of 60%. The outcome of the lottery and the sum of money earned were displayed afterward. If this situation was selected for payment, then the individual would receive the money within 24 h. The probability of winning and the expected rate of return varied across the choice situations (SI Appendix, Table S7). Similar to the measurement of impatience, we compute the mean investment of each individual across the choice situations and then use this measure to rank people, thereby obtaining their percentile positions in the distribution of risk tolerance.

The elicitation of altruism used 20 different choice situations with dictator games (30) that systematically varied the costs and benefits of giving as well as the resulting inequality (SI Appendix, Table S8). These dictator games enable us to construct an overall measure of altruism as well as decomposing this measure into behindness and aheadness aversion (8, 31). The overall

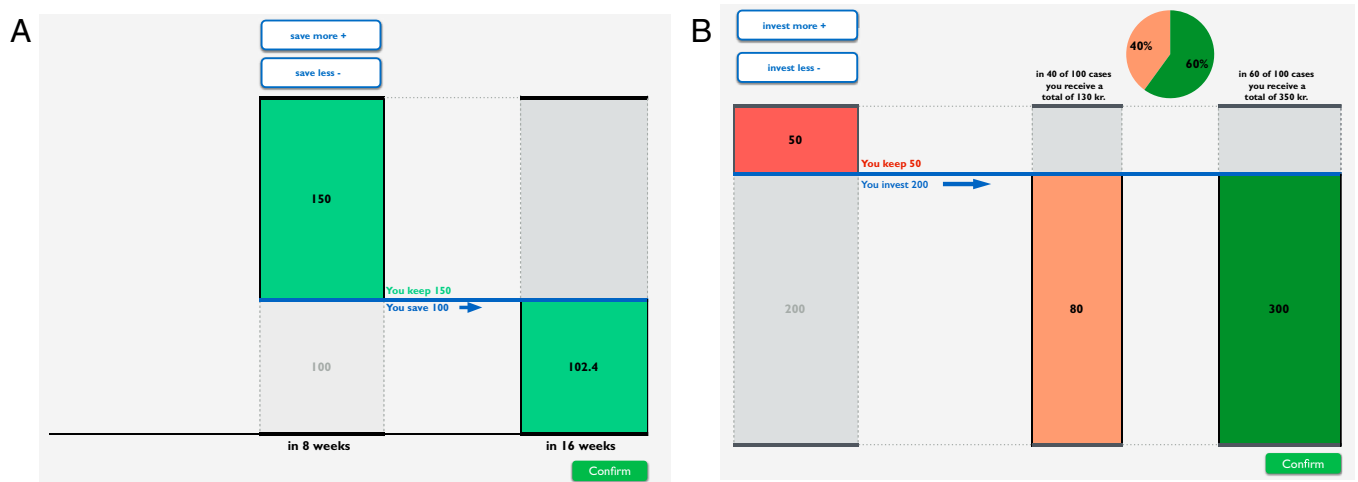


Fig. 1. Screenshots of online experiment eliciting time and risk preferences. (A) Time. (B) Risk.

measure of altruism is the money given to the other person as a share of what the individual could potentially give (the giving rate). As with the other preference measures, we compute the mean giving rate across the 20 choice situations and then use this measure to rank the individual relative to other participants. *SI Appendix, Fig. S1* shows a screenshot for one of the choice situations.

We also asked individuals about age and gender, which can be verified in the registers, and about their school grade point average (GPA), which is used in a few special cases where grades are not included in the register data. Most importantly, we also included a question about the self-assessed capacity to exercise self-control, which is known to be a strong predictor of crime. On average, participants spent 45 min from start to end.

We link the experimental data to administrative records that contain all criminal offenses as well as detailed background information about the individuals. Since crime is a low-frequency outcome, we define a person as criminal if he or she is convicted of a criminal offense committed during the age span 15 to 20. We exclude traffic offenses, which are common but mostly minor offenses that only involve small fines. We focus on the males in our sample who have much higher crime rates than females. The crime rate is 19% for the invited males compared to 3% for the invited females. More details on the crime data and the many background variables included are provided in *SI Appendix, SI Text. SI Appendix, Table S1* also includes summary statistics on the random sample of invited men and on the analysis sample of men who completed all experiments. In line with previous research inviting people to participate in surveys/experiments (25, 28), participants have somewhat different outcomes than nonparticipants, in particular lower crime rates. If we account for the differences between the participants and the population of 18-y-old men by reweighting the observations based on the propensity score estimated on observable characteristics, preferences play an even stronger role than in the main analysis (*SI Appendix, Table S5*, column 6).

The first screen on the internet platform informed the participants about the experiment, the use of the data, and how participants received the payments from the experiment. Participants were asked to give consent and continue to the experiment by clicking on a button on the screen.

## Preferences and Criminal Offenses

Fig. 2 illustrates the bivariate relationship between individuals' preference parameters and their propensity to commit crimes. In all diagrams, the vertical axis shows the probability of being convicted of a crime. On the horizontal axis in Fig. 2*A*, we rank individuals according to their level of risk tolerance going from percentile 1 to 100 in the distribution of risk tolerance. Similarly, Fig. 2*B* ranks individuals according to their level of impatience, and Fig. 2*C* ranks individuals according to their level of altruism. The diagrams show a strong and almost linear relationship between each of the preference parameters and the propensity to commit crime. All relationships are statistically significant at the 1% level of significance.

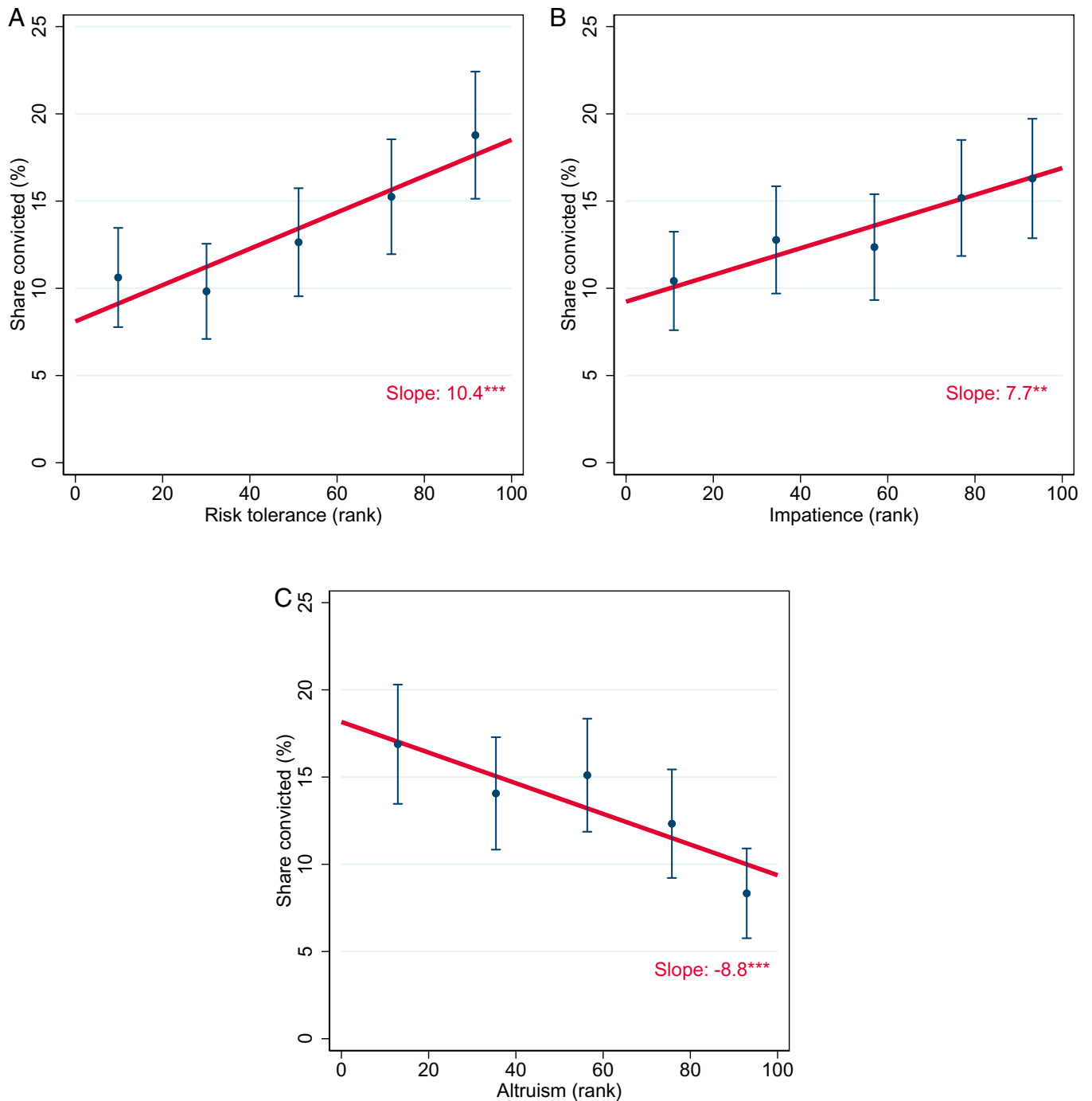
Going from the most risk-averse individuals to the most risk-tolerant individuals is associated with a change in the crime propensity from 8 to 18%, and moving up 10 percentiles in the risk tolerance distribution is associated with a 1 percentage point increase in the crime propensity. The association with impatience is slightly weaker. In this case, moving up 10 percentiles is associated with a 0.8 percentage point increase in the crime propensity. Moving up 10 percentiles in the distribution of altruism is associated with a 0.9 percentage point decrease in the crime propensity.

Table 1 shows results from estimations of multivariate probit models. All three preference parameters are still strongly associated with crime when we move from the bivariate analysis in the graphs to the multivariate analysis in Table 1, second column. Table 1 reports the estimated marginal effects of a change in each of the preferences parameters, for given values of the other preference parameters, on the probability of having committed an offense. The marginal effects are of the same magnitude as the slopes in Fig. 2.

**Table 1. Preferences and probability of having been convicted of an offense**

	Probability of having been convicted of an offense committed at age 15 to 20						At age 19 to 20		
	Only preferences	Adding self-control	Adding GPA	Adding individual controls	Adding parental controls	Full set of controls	Flexible specification	Only preferences	Full set of controls
Risk tolerance	10.9*** (2.5)	10.1*** (2.4)	8.3*** (2.4)	8.3*** (2.4)	8.1*** (2.4)	7.9*** (2.4)	7.4* * (2.4)	7.4*** (2.2)	4.9* (2.0)
Impatience	8.9*** (2.5)	7.6** (2.5)	5.9* (2.5)	5.2* (2.5)	5.2* (2.5)	5.0* (2.4)	5.3* (2.4)	5.5* (2.1)	2.2 (2.0)
Altruism	-7.0** (2.4)	-6.9** (2.4)	-2.7 (2.5)	-2.5 (2.4)	-2.3 (2.4)	-2.5 (2.4)	-2.5 (2.4)	-5.3* (2.1)	-2.4 (2.1)
Self-control		-13.2*** (2.5)	-11.4*** (2.5)	-10.4*** (2.5)	-10.2*** (2.5)	-10.1*** (2.4)	Category indicators		-8.6*** (2.1)
GPA			-16.7*** (2.6)	-14.2*** (2.7)	-12.9*** (2.7)	-13.7*** (2.8)	Decile indicators		-9.7*** (2.4)
Parental income					-1.4 (2.7)	-1.6 (3.4)	Decile indicators		-0.3 (2.8)
Convicted parent (=1)					6.3** (2.1)	5.7** (2.2)	6.1** (2.2)		4.7* (1.9)
Observations	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254
Individual controls				X	X	X	X		X
Parental controls						X	X		X

The table reports the marginal effects on the percentage share of respondents committing crime from estimated probit models. Risk tolerance, impatience, altruism, self-control, GPA, and parental income are all within cohort in sample rank. The eighth column includes flexible controls for self-control, GPA, and parental income instead of continuous measures. For self-control, we use category indicators; for GPA and parental income, we use dummies for each decile. Convicted parent is an indicator. Individual controls include regional fixed effects, large city indicator, immigrant and descendant status, a living with both parents indicator, an only child indicator, a first born indicator, and an indicator for misreported age or gender in the survey. Parental controls include educational level, age at child's birth, employment status, and unemployment history. 13.4% are convicted from age 15 to 20. 9.3% are convicted from age 19 to 20. Robust SEs are in parentheses. \* $P < 0.05$ , \*\* $P < 0.01$ , and \*\*\* $P < 0.001$ .



**Fig. 2.** Association between preferences and criminal offenses. The 95% confidence intervals are based on robust SEs. **\*\* $P < 0.01$**  and **\*\*\* $P < 0.001$** . (A) Risk tolerance. (B) Impatience. (C) Altruism.

In Table 1, third column, we move beyond the rational choice framework by including a measure of self-control. Self-control is known to be strongly associated with crime propensities (12–14). This is also the case in Table 1, third column. Importantly, the effects of the preference parameters are nearly unchanged. The effect of impatience is most affected, which is consistent with the intuitive idea that impatience and self-control are related concepts.

Cognitive skills are known to be strong predictors of criminal behavior (32, 33). One likely reason is that low-skilled individuals obtain lower wages in the labor market and, therefore, face lower opportunity costs of crime (4). Cognitive skills are also known to

be correlated with preferences (34) and are therefore potential confounders. *SI Appendix, Table S2* shows that all three preferences measures are correlated with cognitive skills measured in terms of individuals' GPAs at the end of compulsory schooling (age 15 to 16). The correlation between altruism and GPA is particularly pronounced with less skilled individuals being less altruistic on average.

In Table 1, fourth column, we include the individual's percentile rank position in the GPA distribution in the regression. As expected, this is a strong predictor of crime. Moving up 10 percentiles in the grade distribution is associated with a 1.7 percentage point decrease in the crime propensity conditional on



the other characteristics. Now, altruism is no longer significant, but the effects of risk tolerance and impatience are still large and significant. The effect of moving up 10 percentiles in the risk tolerance distribution or in the impatience distribution corresponds to about a half and one-third of the effect, respectively, of moving up 10 percentiles in the GPA distribution.

In Table 1, fifth column, we include a large set of additional variables that are likely predictive of crime, including region of residence, living in a large city, divorce of parents, immigrant status, having siblings, and birth order (35–39). This reduces the effect of impatience somewhat but has no impact on the effect of risk tolerance. In Table 1, sixth column, we include the percentile position of parents in the distribution of parental income. We also include information on whether parents have committed crime, which is known to be a strong predictor of criminal offenses of sons (40, 41). The position in the income distribution is, in isolation, strongly correlated with crime (*SI Appendix*, Table S2) but not when it is included together with the other variables in Table 1, sixth column. As expected, parental crime is strongly associated with the criminal propensity of sons. Most importantly, the effects of risk tolerance and impatience are almost unchanged when going from the fifth to sixth column in Table 1.

In Table 1, seventh column, we account for additional parental characteristics that are potentially important, including education, age at child birth, recent employment status, and unemployment history (42). This has nearly no impact on the estimated effects of interest. In total, Table 1, seventh column, includes 55 relevant controls beyond the three preference parameters (*SI Appendix*, Table S3).

Overall, school GPA is the strongest predictor of criminal behavior in Table 1, fourth through seventh columns. Across all the specifications, the effect of risk tolerance is significant at the 0.1% level, and its size is about one-half of the effect of school GPA. The effect of impatience is significant at the 5% level and is about one-third of the effect of school GPA.

Identifying the causal impact of preferences on crime propensities is a challenge since preferences are normally considered to be fixed individual characteristics, which makes it impossible to randomly assign preferences to people (25, 43). Following previous work, our analysis examines the association between preferences and crime while controlling for other differences across people that potentially confound the effects of preferences. Although we have an extraordinarily large control set, we cannot know for sure if we fully span all relevant heterogeneity across people. In Table 1, eighth column, we further show that the coefficients on risk tolerance and impatience are almost unchanged, if we allow for a more flexible regression specification with category indicators for self-control and decile indicators for GPA and parental income. *Additional Results and Robustness Checks* reports further results along these lines, including a bounding exercise showing that the effects of preferences are still large if we account for the possibility of unobservable selection effects. Another possibility is that we underestimate the true effects of preferences because we include mediators, i.e., controls that are themselves determined by preferences. For example, the very strong impact of school performance on crime can reflect differences in preferences, which are determinants of school effort and educational investments in theory of human capital (44). According to this view, the more sparse specification in Table 1, second column, may better capture the true effects of preferences.

To enhance the statistical power, we identify a person as criminal if having at least one offense in the age span 15 to 20. In Table 1, ninth and tenth columns, we investigate the predictive power of preferences for future crime by focusing on offenses committed at age 19 to 20, which is after the preference elicitation. The effects become smaller since the crime propensity over 2 y is lower, but importantly, the effect of risk tolerance is significant and still half as large as the effect of GPA.

Table 2 reports results from running the analysis separately for property offenses and violent, sexual, and drug offenses using the specification with all controls as in Table 1, seventh column. The estimates show that risk tolerance and impatience significantly predict property offenses but do not significantly predict violent, drug, and sexual offenses. Conversely, self-control does not significantly predict property offenses but is a significant predictor of violent, drug, and sexual offenses. These results suggest an intuitive separation of crime with property offenses explained well by preferences as hypothesized in the basic choice theory framework, while violent, drug, and sexual offenses are more related to self-control problems.

### Additional Results and Robustness Checks

Here we report the conclusions from additional results and robustness checks shown in *SI Appendix*. In *SI Appendix*, Table S4, we include additional behavioral measures that can be computed from the experiments. For example, we compute a measure that indicates whether respondents are present-biased (45), which relates to the broader measure of self-control problems included in the analysis. This additional measure is insignificant. We also use the behavioral data from our social preference experiment to decompose our measure of altruism into a measure of “behindness aversion” and a measure of “aheadness aversion” (8). A behindness-averse person is willing to give up money in the experiment to reduce the amount the other person receives if this reduces disadvantageous inequality, i.e., the payoff advantage of the other person. An aheadness-averse person is willing to increase the other persons’ payoff in the domain of advantageous inequality, i.e., when the decision-maker has a payoff advantage over the other person. An individual can be behindness averse in the domain of disadvantageous inequality while simultaneously being aheadness averse in the domain of advantageous inequality. When we substitute these measures for the overall altruism measure, we find that crime is strongly associated with behindness aversion but not with aheadness aversion. As in the case with altruism, behindness aversion becomes insignificant when we control for GPA. Finally, we redo the main analysis but rank the participants in the preference distributions according to structural estimates of their preference parameters as is often done in the experimental literature (46, 47). This does not change the results.

In *SI Appendix*, Table S5, we report sensitivity results with respect to changes in variable measurement, sample selection, and empirical specification. It shows that the effects of the key

**Table 2. Probability of having been convicted of different offenses**

	Property offense		Violent, drug, or sexual offense	
Risk tolerance	3.21**	(1.06)	2.34	(1.31)
Impatience	2.16*	(0.96)	0.87	(1.38)
Altruism	−1.28	(0.98)	−1.33	(1.36)
Self-control	−1.47	(0.95)	−6.47***	(1.50)
GPA	−5.09***	(1.45)	−5.73***	(1.70)
Parental income	−1.19	(1.42)	−0.53	(1.77)
Convicted parent (=1)	1.18	(0.78)	1.62	(1.26)
Observations	2,254		2,254	
Mean outcome (%)	2.40		4.21	
Individual controls	X		X	
Parental controls	X		X	

The results correspond to Table 1, seventh column, but with two different outcomes: the probability of being convicted of a property offense and the probability of being convicted a violent, drug, or sexual offense committed at age 15 to 20. Robust SEs are in parentheses. \* $P < 0.05$ , \*\* $P < 0.01$ , and \*\*\* $P < 0.001$ .

preference parameters are unchanged if we only include math grades in GPA (*SI Appendix, Table S5*, column 2), which might be a better proxy for differences in cognitive skills. Similarly, the conclusions are the same if we estimate a linear probability model instead of a probit model (*SI Appendix, Table S5*, column 3), if we adjust for bias from unobservable selection using the Oster method (*SI Appendix, Table S5*, column 4) (48) or substitute the percentile rank variables with the corresponding z scores (*SI Appendix, Table S5*, column 5). The effects of interest are a little higher if we account for selection into the experiment by applying propensity score weighted regressions that account for observable differences between participants and nonparticipants (*SI Appendix, Table S5*, column 6). If we include women in the sample (*SI Appendix, Table S5*, column 7), the effect of risk preference falls somewhat, but both risk and time preferences are still significant. In the main analysis, if individual information does not exist on an explanatory variable, then this is captured by an indicator variable. If we instead remove respondents altogether when information is missing on one or more variables, then the main effects of interest fall somewhat, but the relative magnitudes of risk, impatience, self-control, and GPA are unchanged (*SI Appendix, Table S5*, column 8).

### Concluding Remarks

Our results show that differences in preferences predict who commits crime. Risk tolerance, impatience, and altruism are all associated with the crime propensity. Impatience and, in particular, risk tolerance strongly predict crime when we control for an extensive set of background characteristics. The most risk-tolerant individuals have a crime propensity that is 8 to 10 percentage points higher than the least risk-tolerant individuals. This effect is half the size of the effect of cognitive skills, which is the best predictor of crime. Evidence on crime levels across countries does not place Denmark as very different from other countries (49). In that respect, there is no reason to believe that our results should be unique to Denmark.

One of the criminal justice system's key functions is deterrence of crime. The choice theory of crime implies that policy initiatives

that increase the certainty and severity of sanctions deter crime. However, a theoretical implication of our evidence on the importance of differences in preferences is that those who are most prone to commit crime are also those who are least responsive to increases in certainty and severity of sanctions (*SI Appendix, SI Text*). This might help explain the somewhat mixed evidence on the effectiveness of sanctions on deterrence (4).

We also find that variation in preferences significantly predicts property offenses but not crimes of passion such as violent, sexual, and drug offenses. Conversely, we find that self-control significantly predicts crimes of passion but not property crime. At a broader level, these findings, together with previous results (27, 50), suggest that the choice theory framework might be most relevant for understanding certain types of crime such as white-collar crime but not for other types of crime such as violence and sexual assaults where other behavioral parameters might be more appropriate.

**Data Availability.** Our empirical analysis combines experimental data and administrative register data linked together using social security numbers. The project was approved by the Danish Data Protection Agency under Agreement 2015-57-0125-0008 and was also approved by Statistics Denmark and the Internal Review Board at the Department of Economics, University of Copenhagen. Data and programs are stored in a separate directory at Statistics Denmark with project number 704856. The empirical analyses were carried out with the software Stata/MP 16.1 using the secure internet interface of Statistics Denmark. Individual-level data are subject to the European Union's General Data Protection Regulation. Due to privacy rules, the data may not be transferred to computers outside Statistics Denmark. Researchers interested in obtaining access to the data employed in this paper are required to submit a written application to gain approval from Statistics Denmark. Applications can be submitted by researchers who are affiliated with Danish institutions accepted by Statistics Denmark or by researchers outside of Denmark who collaborate with researchers affiliated with these institutions. We will assist in any way we can with this procedure.

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## Supplementary Information for

### Preferences predict who commits crime among young men

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#### This PDF file includes:

Supplementary text  
Fig. S1 (not allowed for Brief Reports)  
Tables S1 to S8 (not allowed for Brief Reports)  
SI References

## Supporting Information Text

**A Basic Choice Model of Criminal Behavior.** Here we illustrate the role of risk preferences and time preferences in a simple two-period model of criminal behavior. We assume the preferences of an individual can be represented by the objective function

$$\Omega(a) = u(c_1(a)) + \beta [pu(c_2^A(a)) + (1-p)u(c_2^B(a))],$$

where  $c_1$  denotes consumption in period 1, depending on whether the individual engage in crime ( $a = 1$ ) or not ( $a = 0$ ), whereas  $p$  is the probability of detection in which case consumption in period 2 becomes  $c_2^A$ . Otherwise consumption in period 2 equals  $c_2^B$ . The parameter  $\beta$  is the weight of an individual on future utility (patience) and  $u(\cdot)$  is a concave utility function.

The consumption levels equal

$$\begin{aligned} c_1(a) &= (1 + a\gamma)y, \\ c_2^A(a) &= (1 - a\eta)y, \\ c_2^B(a) &= y, \end{aligned}$$

where  $y$  is a fixed income,  $\gamma$  is the gain from criminal activity measured in proportion to income, and  $\eta$  is the loss if detected measured in proportion to income. Gains and losses can be money/consumption but, more broadly it can also include non-pecuniary effects that correspond to a given gain or loss in consumption. Crime enforcement policy can change the probability of detection  $p$  and the loss if detected  $\eta$ .

The incentive to commit crime equals  $\Psi = \Omega(1) - \Omega(0)$ , which gives

$$\Psi = u((1 + \gamma)y) + \beta [pu((1 - \eta)y) + (1 - p)u(y)] - (1 + \beta)u(y). \quad [1]$$

If it is assumed that the consumption levels associated with criminal activity are well approximated by second-order Taylor expansions around the non-crime consumption level,  $y$ , then we can write

$$\begin{aligned} u((1 + \gamma)y) &\approx u(y) + u'(y)\gamma y + \frac{1}{2}u''(y)(\gamma y)^2 = u(y) + u'(y)y\gamma\left(1 - \frac{1}{2}\theta\gamma\right), \\ u((1 - \eta)y) &\approx u(y) - u'(y)\eta y + \frac{1}{2}u''(y)(\eta y)^2 = u(y) - u'(y)y\eta\left(1 + \frac{1}{2}\theta\eta\right), \end{aligned}$$

where  $\theta \equiv -\frac{u''(y)y}{u'(y)}$  is the coefficient of relative risk aversion. By substituting these expressions into (1), the incentive to commit crime becomes

$$\Psi = u'(y)y \left[ \gamma \left(1 - \frac{1}{2}\theta\gamma\right) - \beta p\eta \left(1 + \frac{1}{2}\theta\eta\right) \right]. \quad [2]$$

The first term in the bracket is the benefit of engaging in crime, which is decreasing in the risk aversion parameter  $\theta$  because marginal utility is decreasing. The second term in the bracket is the expected loss, which is increasing in the risk aversion parameter and in the patience parameter  $\beta$ . It follows from the equation that the incentive to commit crime is decreasing in both the risk aversion parameter and the patience parameter, i.e.,  $\partial\Psi/\partial\theta < 0$  and  $\partial\Psi/\partial\beta < 0$ . It also follows that the incentive to commit crime is decreasing in the enforcement parameters, i.e.,  $\partial\Psi/\partial p < 0$  and  $\partial\Psi/\partial\eta < 0$ , and that the effect of enforcement on the incentive to commit crime is (numerically) larger for more risk averse and more patient people, i.e.,  $\frac{\partial^2\Psi}{\partial p\partial\theta} < 0$ ,  $\frac{\partial^2\Psi}{\partial p\partial\beta} < 0$ ,  $\frac{\partial^2\Psi}{\partial\eta\partial\theta} < 0$ , and  $\frac{\partial^2\Psi}{\partial\eta\partial\beta} < 0$ .

If we assume that the propensity to commit crime  $\Pi$  is an increasing, concave function of the incentive to commit crime, i.e.,  $\Pi : \Psi \rightarrow (0, 1)$  where  $\Pi'(\Psi) > 0$  and  $\Pi''(\Psi) \leq 0$ , then we have

**Proposition (i)** *The propensity to commit crime is decreasing in the degree of risk aversion  $\theta$  and patience  $\beta$ , i.e.,  $\partial\Pi/\partial\theta < 0$  and  $\partial\Pi/\partial\beta < 0$ . (ii) Stricter crime enforcement, which increases  $p$  or  $\eta$ , reduce crime propensities most for risk averse and patient individuals,  $\frac{\partial^2\Pi}{\partial p\partial\theta} < 0$ ,  $\frac{\partial^2\Pi}{\partial p\partial\beta} < 0$ ,  $\frac{\partial^2\Pi}{\partial\eta\partial\theta} < 0$ , and  $\frac{\partial^2\Pi}{\partial\eta\partial\beta} < 0$ .*

**Proof (i)** By differentiating, we find  $\partial\Pi/\partial\theta = \Pi'(\Psi)\frac{\partial\Psi}{\partial\theta} < 0$  and  $\Pi'(\Psi)\frac{\partial\Psi}{\partial\beta} < 0$ . (ii) By differentiating, we find  $\frac{\partial^2\Pi}{\partial p\partial\theta} = \Pi'(\Psi)\frac{\partial^2\Psi}{\partial p\partial\theta} + \Pi''(\Psi)\frac{\partial\Psi}{\partial p}\frac{\partial\Psi}{\partial\theta} < 0$ ,  $\frac{\partial^2\Pi}{\partial p\partial\beta} = \Pi'(\Psi)\frac{\partial^2\Psi}{\partial p\partial\beta} + \Pi''(\Psi)\frac{\partial\Psi}{\partial p}\frac{\partial\Psi}{\partial\beta} < 0$ ,  $\frac{\partial^2\Pi}{\partial\eta\partial\theta} = \Pi'(\Psi)\frac{\partial^2\Psi}{\partial\eta\partial\theta} + \Pi''(\Psi)\frac{\partial\Psi}{\partial\eta}\frac{\partial\Psi}{\partial\theta} < 0$ , and  $\frac{\partial^2\Pi}{\partial\eta\partial\beta} = \Pi'(\Psi)\frac{\partial^2\Psi}{\partial\eta\partial\beta} + \Pi''(\Psi)\frac{\partial\Psi}{\partial\eta}\frac{\partial\Psi}{\partial\beta} < 0$ . ■

The proposition shows that people with a lower degree of risk aversion and a lower degree of patience are more prone to commit crime and are less responsive to crime enforcement.

**Administrative data.** From Statistics Denmark we use the crime registers for charges (KRSI) and convictions (KRAF). Entries in the two registers can be linked using a file number (`journr*`). From KRSI we use the date of the committed offence (`sig_gerldto`). Not all convictions have a related charge. In these cases we assume that the offence was committed on the date of the conviction. The convictions in the KRAF register are categorized using a seven digit code in the variable `afg_ger7`. The first digit indicates whether the conviction is related to the criminal code (1), the traffic code (2) or other special laws (3). We discard convictions under the traffic code. The two first digits are used to divide the convictions into sexual offences (11), violent offences (12), property offences (13) and drug offences (32). We use this information to generate indicators for having been convicted of different types of crime. From the register UDFK we have information on grades in lower secondary school. We compute the grade point average across subjects in the final exams. For 63 participants we do not have information on any final exams in 9th or 10th grade. For 43 of these participants, we use self-reported GPA in the survey or their mark for general proficiency where possible. For the remaining 20 participants we assume that they have not passed any final exams and assign them a GPA of 0. Based on the grade point average, we compute the rank/percentile position of each participant in the grade point average distribution of all participants, `gpa_r`. We use ordinal ranking, which ensures a uniform distribution of percentile positions, also when some of the underlying observations are identical. We also compute the GPA only based on the subject math, `gpa_math_r`, which we use in the sensitivity analyses in column 2 of Table S5.

We use the population register (BEF) to identify participants' gender, birth year, immigrant and descendant status, region of residence, and whether their municipality is characterized as a city (according to the "Kommunegrupper" characterization provided by Statistics Denmark). We also use information in the BEF register to identify the participants' parents and the variable `fm_mark` to identify whether they live with both parents or not, e.g. if the parents are divorced. Using municipality (`kom`) and address (`bopikom`) in the BEF register we link participants to the household register (HUST). Here we obtain information on the number of children in the household when the participant was 0 years old as an indicator of whether the participant is the first born child, and the number of children in the household when the participant was 10 years old as an indicator for having siblings.

For the parents, we also use the population register to compute their age when the participant was born and the crime register to compute an indicator of whether they have committed a criminal offence, excl. traffic offences. In the analyses, we use whether the parents are convicted of a crime committed from age 15 to 20 (as for the young men in the sample), but the results are the same if we use an indicator for whether the parents have been convicted at any age. Furthermore, we use the income register (IND) to compute the parents' average income in 2015 prices across the years when the participant was 17 to 19 years old. As for the grade point average, we compute the percentile position in the parent income distribution, `income_parents_r`. We use the employment register (IDAP) to compute indicators of parents employment status in 2017 (employed, self-employed, unemployed and not in the work force) and unemployment between 2008 and 2017. We first compute the average share of time they have been unemployed (based on `arledgr`) and compute indicators of not having been unemployed, having been unemployed from 0 to 10% of the time and from 10% to 100% of the time. Finally, we use the education register (UDDA) to compute indicators for the parents' levels of education based on the Danish ISCED classification (primary or lower secondary, upper secondary, short cycle tertiary, bachelor or equivalent, and master, doctoral or equivalent).

For each participant, we predict the probability of participation, i.e. the propensity score, based on a probit model where we include the register data that is available for both participants and non-participants as explanatory variables. We use this for the propensity score weighting in column 6 of Table S5.

**Experimental data.** Based on the data from our incentivized behavioral experiments, we compute each individual's time, risk and social preferences. In addition, the experimental data enable us to identify individuals' present bias and their behindness and aheadness aversion which we use for sensitivity and robustness checks in table S4.

We use the time experiment to compute the impatience measure, which is the mean share kept across choice situations in Table S6. Based on this, we compute the percentile positions in the impatience distribution for all participants, `impatience_r`, in the same way as we do for grade point average and parental income. Since participants were randomly assigned to either a high or low stake condition, we compute the percentiles separately for the two conditions. We also use the data from the time experiment to compute percentile positions within the distribution of present bias, `present_bi_r`. Here we first compute the difference in the share kept between two situations with the same interest rate but with different timing of payout, e.g. situation 1 and 9 in Tables S7. We then compute the mean across the 8 computed differences and rank the participants accordingly. Similarly, we use the risk experiment to compute each participant's risk tolerance percentile position, `risk_toler_r`. Finally, we use the social experiment to compute each participant's altruism percentile position, `altruism_r`. As seen in Table S8, the cost of giving varies across situations, and in particular it is positive in some cases, i.e. it cost money for the participant to increase the other's payoff, and negative in others, i.e. the participant gets money for increasing the other's payoff. We compute a measure of aheadness aversion from the situations with a positive cost of giving (i.e. negative slope in the trade-off) and a measure of behindness aversion from the situations with a negative cost of giving (i.e. a positive slope in the trade-off). Again, we compute each participant's positions in the distributions, `altruism_pos_r` and `altruism_neg_r`.

As an alternative to the non-parametric preference measures described above, we also estimate structural preference parameters for the three choice domains and use these in the sensitivity analysis in column 5 of Table S4. To estimate the discrete choice models we assume random utility with choice-domain-specific error parameters. More specifically, we back out individual-level parameters from mixed logit models with normally distributed behavioral parameters. As for the

\*Names written with monospaced typewriter typeface refer to variable names. For the variables from Statistics Denmark's records, these are the names Statistic Denmark has assigned (see definitions here: [www.dst.dk/da/Statistik/dokumentation/Times](http://www.dst.dk/da/Statistik/dokumentation/Times)).

non-parametric preference measures, we then compute percentile positions based on the estimated parameter distribution. We implement a hierarchical Bayesian procedure to estimate the mixed logit models. This procedure is described in detail elsewhere (1, 2).<sup>†</sup> In the following models,  $i$  denotes the individual and  $j$  denotes the choice situation.

Based on the risk task, we define  $R_{ij}$  as the binary lottery the individual faces as a consequence of the chosen allocation (see *Material and Methods*) and estimate an expected utility model (3), which assigns the value  $V$  to the alternative  $R_{ij}$ :

$$V(R_{ij}) = p_j u_i(w_{1ij}) + (1 - p_j) u_i(w_{2ij}),$$

with  $u_i(w_{ij}) = w_{ij}^{1-\rho_i}$  where  $p_j$  is the probability that the good state occurs,  $w_{1ij}$  and  $w_{2ij}$  are the payoffs in the good and the bad state, and  $\rho_i$  denotes the (Arrow-Pratt) coefficient of relative risk aversion. Higher values of  $\rho_i$  indicates comparatively more risk aversion.

Based on the time task, we define  $T_{ij}$  as the income stream the individual faces as a consequence of the chosen allocation and estimate a quasi-hyperbolic discounted utility model (4),<sup>‡</sup> which assigns the value  $V$  to the alternative  $T_{ij}$ :

$$V(T_{ij}) = d(t_{1j}) v_i(w_{1ij}) + d(t_{2j}) v_i(w_{2ij}),$$

with  $v_i(w_{ij}) = w_{ij}^{1-\gamma_i}$ , where  $t_{1j}$  and  $t_{2j}$  denote the payment delays in months relative to the time of the experiment ( $0 \leq t_{1j} < t_{2j}$ ),  $w_{1ij}$  and  $w_{2ij}$  are the payoffs at the earlier and later point in time, and  $\gamma$  denotes an (Arrow-Pratt-type) coefficient of relative aversion towards income fluctuations over time. Finally,  $d(t_{.j}) = 1$  if  $t_{.j} = 0$  and  $d(t_{.j}) = \beta_i e^{-\eta_i \frac{t_{.j}}{12}}$  otherwise, where  $\eta_i \geq 0$  denotes the (annualized) rate of time preference and  $\beta_i$  present bias (for  $\beta_i < 1$ ) or future bias (for  $\beta_i > 1$ ).

Based on the social task, we define  $S_{ij}$  as the interpersonal distribution the individual faces as a consequence of the chosen allocation and estimate an inequality aversion model (6), which assigns the value  $V$  to the alternative  $S_{ij}$ :

$$V(S_{ij}) = w_{ownj} - \alpha_i (w_{otherj} - w_{ownj}) \mathbb{1}[w_{ownj} < w_{otherj}] - \beta_i (w_{ownj} - w_{otherj}) \mathbb{1}[w_{ownj} > w_{otherj}],$$

where  $w_{ownj}$  is the payoff to the participant,  $w_{otherj}$  is the payoff to the other person and  $\alpha_i$  and  $\beta_i$  denote behindness aversion and aheadness aversion, respectively.

Participants in the experiment also responded to a few survey questions: self-reported gender, self-reported birth year, self-reported GPA and self-reported self-control. For the last variable the question asked was “I am good at exercising self-control in my actions and decisions” and participants answered this question on a 7 point Likert scale where 1 was “strongly disagree” and 7 was “strongly agree”. Using the same procedure as for the other explanatory variables, we compute the percentile position in the self-control distribution, `selfcontrol_r`. For all the percentile position variables we also compute the z-scores based on the raw variables where we subtract the mean across all participant and divide by the standard deviation. We use this in Table S5.

<sup>†</sup>We assume uninformative prior distributions. In addition, we adopt appropriate transformations of the distributions to ensure that the estimated parameters lie within the range of their theoretical support.

<sup>‡</sup>Since the individuals were assigned to a high or low stake condition, we estimate separate models for the two conditions and obtain condition-specific rankings of individuals to avoid the ordering being confounded by the magnitude effect (see e.g. (5)).

Figures



Fig. S1. Screenshot of online experiment eliciting social preferences

Notes: This is an example of one of the choice situations (Situation 9 in Table S8). The subject can choose one out of eleven payoff allocations where the blue bars to the left show the money received by the subject, while the green bars to the right show the money received by a randomly assigned other person. The individual has chosen option number six, which gives DKK 188 to each person.



## Tables

Table S1. Summary statistics

	Sample (1)	Logins (2)	Invited (3)	Difference (1) - (3) (4)	P-value (%) (5)
Crime age 15-20 (%)	13.4	14.0	19.0	-5.6	0.0
GPA	7.5	7.4	6.6	0.9	0.0
Immigrant (%)	3.2	3.4	5.2	-2.0	0.0
Descendant (%)	6.6	7.0	7.9	-1.3	0.3
Northern Jutland (%)	9.8	9.9	10.5	-0.7	16.3
Middle Jutland (%)	24.6	24.3	23.7	0.9	21.0
Southern Denmark (%)	25.4	25.2	23.1	2.3	0.2
Copenhagen (%)	26.4	26.2	28.0	-1.7	3.1
Sealand (%)	13.8	14.4	14.7	-0.9	13.1
Capitol municipality (%)	21.9	21.7	23.9	-2.0	0.6
Large city municipality (%)	11.9	11.8	11.0	0.9	12.8
Small city municipality (%)	25.7	25.2	24.3	1.4	6.4
Hinterland municipality (%)	19.0	19.1	17.8	1.2	8.1
Rural municipality (%)	21.5	22.2	23.0	-1.5	3.9
First born (%)	37.9	37.7	36.4	1.5	7.6
Only child (%)	10.8	10.3	10.2	0.6	26.4
Lives w. both parents (%)	60.1	58.9	55.0	5.1	0.0
Father's inc. (1.000 DKK)	565.9	552.4	542.3	23.6	5.0
Mother's inc. (1.000 DKK)	399.4	394.1	386.8	12.6	0.7
Mother's age at birth	30.2	30.1	29.8	0.4	0.0
Father's age at birth	32.7	32.6	32.5	0.2	8.0
Missing father info (%)	2.3	2.6	3.3	-1.0	0.0
Missing mother info (%)	0.6	0.8	1.7	-1.1	0.0
Observations	2254	2650	7054		

*Notes:* In column (1), the *Sample* consists of the respondents who completed all the experiments on the online platform and are used in the analysis. In column (2), *Logins* are everyone who logged into the online platform. Column (3) shows descriptives for the random sample of 18 year old men who were invited to participate. Column (4) shows the difference between participants used in the analysis and everyone who was invited (incl. participants). Column (5) shows the P-values of the differences in column (4). The P-values are calculated using partially overlapping samples t-test with Welch's degrees of freedom (7, 8).

**Table S2. Pairwise correlations of regressors and outcome**

	Convicted	Risk	Impatience	Altruism	Self-control	GPA	Income	Conv. parent
Convicted (=1)	1.00	0.09	0.07	-0.07	-0.12	-0.17	-0.10	0.10
Risk tolerance	0.09	1.00	-0.12	-0.11	-0.04	-0.13	-0.05	0.04
Impatience	0.07	-0.12	1.00	-0.07	-0.11	-0.12	-0.07	0.01
Altruism	-0.07	-0.11	-0.07	1.00	0.01	0.27	0.08	-0.06
Self-control	-0.12	-0.04	-0.11	0.01	1.00	0.12	0.08	-0.04
GPA	-0.17	-0.13	-0.12	0.27	0.12	1.00	0.34	-0.12
Parental income	-0.10	-0.05	-0.07	0.08	0.08	0.34	1.00	-0.08
Convicted parent (=1)	0.10	0.04	0.01	-0.06	-0.04	-0.12	-0.08	1.00

*Notes:* The table shows pairwise correlations between the different key regressors in the analysis and between each regressor and the outcome (*Convicted*).

**Table S3. Economic preferences and probability of having been convicted of an offence committed at age 15 to 20**

	Probability of having been convicted	
Risk tolerance	7.87***	(2.37)
Impatience	4.97*	(2.44)
Altruism	-2.46	(2.42)
Self-control	-10.06***	(2.43)
GPA	-13.75***	(2.76)
Parental income	-1.57	(3.37)
Convicted parent (=1)	5.69**	(2.21)
Geography (=1)		
Middle Jutland	1.33	(2.39)
Southern Denmark	0.21	(2.35)
Copenhagen	3.26	(2.64)
Sealand	1.19	(2.74)
Urban area	-1.42	(1.75)
Family and background (=1)		
Immigrant	-2.50	(5.06)
Descendant	5.29*	(2.69)
Lives with both parents	-3.59*	(1.49)
Only child	1.67	(2.23)
First born	-4.62**	(1.60)
Misreport age or gender (=1)	3.53	(4.14)
Missing father information	-8.85	(9.05)
Father's age at birth (=1)		
24-25	-2.06	(4.87)
26-27	-2.30	(4.40)
28-29	-4.95	(4.46)
30-31	-2.35	(4.38)
32-33	-4.37	(4.43)
34-35	-6.65	(4.58)
36-37	-8.51	(4.76)
38-39	-6.96	(4.98)
>39	-8.70	(4.91)
Father's educational level (=1)		
Upper secondary	-0.30	(2.04)
Short cycle tertiary	0.64	(3.33)
Bachelor or equivalent	2.75	(2.71)
Master, Doctoral or equivalent	2.19	(3.02)
Missing	-3.82	(5.66)
Father's employment status (=1)		
Self-employed	2.23	(2.64)
Unemployed	-12.13	(6.90)
Not in the workforce	4.46*	(2.27)
Missing	1.49	(3.30)
Father's avg. unemployment 10 yr. (=1)		
1-10%	0.06	(1.90)
11-100%	-0.24	(2.44)
Missing mother information	1.89	(11.44)
Mother's age at birth (=1)		
24-25	1.78	(3.55)
26-27	2.49	(3.23)
28-29	4.70	(3.25)
30-31	3.97	(3.41)
32-33	2.59	(3.52)
34-35	2.76	(3.63)
36-37	1.82	(4.18)
38-39	5.19	(4.94)
>39	8.51	(5.62)
Upper secondary	-1.58	(2.18)
Mother's educational level (=1)		
Short cycle tertiary	-4.25	(4.12)
Bachelor or equivalent	-0.40	(2.49)
Master, Doctoral or equivalent	2.44	(3.17)
Missing	4.27	(5.93)
Mother's employment status (=1)		
Self-employed	3.32	(3.30)
Unemployed	-10.22	(5.89)
Not in the workforce	1.73	(2.06)
Missing	0.59	(5.43)
Mother's avg. unemployment 10 yr. (=1)		
1-10%	1.42	(1.84)
11-100%	4.83*	(2.08)
Observations	2254	

Notes: The table reports the marginal effects in p.p. from the same probit model as in column (6) of Table 1. Robust standard errors in parentheses.  
\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

Table S4. Economic preferences and probability of having been convicted of an offence committed at age 15 to 20

	Probability of having been convicted				
	(1)	(2)	(3)	(4)	(5)
Present bias	2.0 (2.4)			0.8 (2.3)	-3.5 (2.7)
Aheadness aversion		-1.8 (2.4)		-1.8 (2.3)	-2.3 (2.6)
Behindness aversion			10.9*** (2.5)	1.4 (2.7)	3.0 (2.7)
Risk tolerance				7.9*** (2.4)	7.9** (2.4)
Impatience				4.9* (2.4)	6.2* (2.7)
Self-control				-10.0*** (2.4)	-10.3*** (2.4)
GPA				-13.9*** (2.8)	-13.4*** (2.8)
Parental income				-1.5 (3.4)	-2.1 (3.4)
Convicted parent (=1)				5.7** (2.2)	5.5* (2.2)
Observations	2254	2254	2254	2254	2254
Individual controls				✓	✓
Parental controls				✓	✓
Structural prefs.					✓

Notes: The table reports the marginal effects in p.p. from estimated probit models. *Present bias*, *Behindness aversion*, *Aheadness aversion*, *Risk tolerance*, *Impatience*, *Self-control*, *GPA*, and *Parental income* are all within cohort in sample ranks. *Convicted parent* is an indicator. *Individual controls* include regional FE, an urban area indicator, immigrant and descendant status, a living with both parents indicator, an only child indicator, a first born indicator and an indicator for misreported age or gender in survey. *Parental controls* include educational level, age at child's birth, employment status and unemployment history. *Structural prefs.* indicates that we use structurally estimated preference measures in column (5) instead of the non-parametric measures. Robust standard errors in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

**Table S5. Economic preferences and probability of having been convicted of an offence committed at age 15 to 20**

	Baseline	Math GPA	LPM	Bias-adjusted	z-scores	Weighted	Incl. women	All information
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Risk tolerance	7.9*** (2.4)	7.9*** (2.4)	8.1** (2.5)	7.3	2.3*** (0.7)	9.1** (3.0)	4.7*** (1.4)	6.8** (2.5)
Impatience	5.0* (2.4)	5.1* (2.4)	4.7* (2.4)	3.7	1.6* (0.7)	7.0* (3.0)	5.4*** (1.5)	4.5 (2.5)
Altruism	-2.5 (2.4)	-2.3 (2.4)	-2.4 (2.5)	-0.1	-0.9 (0.7)	-1.0 (3.0)	0.2 (1.4)	-2.8 (2.5)
Self-control	-10.1*** (2.4)	-9.9*** (2.5)	-10.2*** (2.6)	-8.5	-2.9*** (0.6)	-11.3*** (3.1)	-7.0*** (1.4)	-8.0** (2.6)
GPA	-13.7*** (2.8)	-12.5*** (2.6)	-13.1*** (2.7)	-8.0	-3.8*** (0.7)	-17.2*** (3.7)	-12.2*** (1.6)	-12.0*** (2.9)
Parental income	-1.6 (3.4)	-1.7 (3.4)	-2.3 (3.5)	6.9	-0.5 (0.5)	-3.5 (4.0)	0.0 (1.9)	-1.5 (3.6)
Convicted parent (=1)	5.7** (2.2)	5.6* (2.2)	7.8* (3.1)	6.4	5.5* (2.2)	7.2** (2.7)	3.4** (1.2)	5.0* (2.3)
Observations	2254	2254	2254	2254	2254	2254	4503	2011
Individual controls	✓	✓	✓	✓	✓	✓	✓	✓
Parental controls	✓	✓	✓	✓	✓	✓	✓	✓

*Notes:* Column (1) is the baseline result from column (6) of Table 1 in the main text. Column (2) uses GPA only for math. Column (3) shows OLS estimates in p.p. from a linear probability model. Column (4) shows biased-adjusted OLS estimates using the Oster bounding approach (9) with  $\delta = 1$  and  $\Pi = 1.3$ . Column (5) uses z-scores for the explanatory variables instead of ranks. Column (6) weighs the observations with the inverse probability of being in the sample using all explanatory variables that are also available for non-participants. Column (7) includes women born in 1999. Column (8) excludes participants for whom we do not observe all information in the administrative data, most importantly GPA and parental information. *Risk tolerance*, *Impatience*, *Altruism*, *Self-control*, *GPA*, and *Parental income* are all within cohort in sample ranks. *Convicted parent* is an indicator. *Controls* include regional FE, an urban area indicator, immigrant and descendant status, a living with both parents indicator, an only child indicator, a first born indicator, an indicator for misreported age or gender in survey, parents' educational level, parents' age at child's birth, parents' employment status and unemployment history. Robust standard errors in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .



Table S6. Choice situations in the time experiment

Situation	Low stakes		High stakes		$t_1$	$t_2$	Rate
	$x_1$	$x_2$	$x_1$	$x_2$			
1	250	251	7500	7530	0	2	0.024
2	250	256	7500	7680	0	2	0.153
3	250	261	7500	7830	0	2	0.295
4	250	266	7500	7980	0	2	0.451
5	250	271	7500	8130	0	2	0.622
6	250	276	7500	8280	0	2	0.811
7	250	281	7500	8430	0	2	1.016
8	250	286	7500	8580	0	2	1.242
9	250	251	7500	7530	2	4	0.024
10	250	256	7500	7680	2	4	0.153
11	250	261	7500	7830	2	4	0.295
12	250	266	7500	7980	2	4	0.451
13	250	271	7500	8130	2	4	0.622
14	250	276	7500	8280	2	4	0.811
15	250	281	7500	8430	2	4	1.016
16	250	286	7500	8580	2	4	1.242

*Notes:*  $x_1$  is the amount the participant can get paid out sooner and  $x_2$  is the amount the participant can get paid out later. They differ by whether the participant was assigned to the low or high stake treatment.  $t_1$  indicates the sooner payout time (either within 24 hours (0) or in 2 months) while  $t_2$  indicates the later payout time (either in 2 months or in 4 months). The user interface displayed the delays in weeks to avoid confounds by payments at different weekdays. Rate is the annualized interest rate the participant gets on the amount saved for two months. For instance, in Situation 1, Rate=0.024 refers to a yearly interest rate of 2.4%. Panel (a) of Figure 1 in the main text illustrates situation 10 with low stakes.

Table S7. Choice situations in the risk experiment

Situation	DKK	$p$	Good	Bad
1	250	0.5	1.21	0.81
2	250	0.2	1.41	0.91
3	250	0.8	1.11	0.61
4	250	0.5	1.31	0.71
5	250	0.2	1.61	0.86
6	250	0.8	1.16	0.41
7	250	0.5	1.35	0.75
8	250	0.2	1.65	0.90
9	250	0.8	1.20	0.45
10	250	0.6	1.50	0.40
11	250	0.4	1.72	0.62
12	250	0.6	1.45	0.35
13	250	0.4	1.67	0.57
14	250	0.5	1.51	0.50
15	250	0.5	1.61	0.60

*Notes:* *DKK* is the amount the participant can keep or invest in the lottery.  $p$  is the probability that the lottery will give the good state. *Good* is the multiplier of the investment in the good state while *Bad* is the multiplier of the investment in the bad state. Panel (b) of Figure 1 in the main text illustrates situation 10.

Table S8. Choice situations in the social experiment

Situation	$own_1$	$other_1$	$own_2$	$other_2$	Cost of giving
1	262.5	137.5	112.5	237.5	1.500
2	250.0	125.0	125.0	250.0	1.000
3	237.5	112.5	137.5	262.5	0.667
4	225.0	112.5	150.0	262.5	0.500
5	212.5	112.5	162.5	262.5	0.333
6	212.5	100.0	162.5	275.0	0.286
7	200.0	100.0	175.0	275.0	0.143
8	187.5	100.0	187.5	275.0	-0.000
9	175.0	100.0	200.0	275.0	-0.143
10	175.0	112.5	200.0	262.5	-0.167
11	162.5	100.0	212.5	275.0	-0.286
12	162.5	112.5	212.5	262.5	-0.333
13	187.5	187.5	200.0	250.0	-0.200
14	212.5	112.5	187.5	187.5	0.333
15	187.5	187.5	212.5	262.5	-0.333
16	250.0	125.0	187.5	187.5	1.000
17	187.5	187.5	225.0	275.0	-0.429
18	262.5	162.5	187.5	187.5	3.000
19	187.5	187.5	192.5	292.5	-0.048
20	192.5	92.5	187.5	187.5	0.053

Notes:  $own_1$  is the amount the participant gets if he/she gives the smallest possible amount to the other person.  $other_1$  is the smallest possible amount to give.  $own_2$  is the amount the participant gets if he/she gives the largest possible amount to the other person.  $other_2$  is the largest possible amount to give. Thus, for a given choice situation ( $other_1$ ,  $other_1$ ) and ( $other_2$ ,  $other_2$ ) represent the most extreme allocations in the set of feasible payoff allocations. In every choice situation there were 9 further feasible payoff allocations located between the extremes in an equi-distant way. *Cost of giving* denotes the cost of the participant per DKK given to the other person. A negative value means that the participant benefit per DKK given to the other person.

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