The Heritability of Moral Standards for Everyday Dishonesty★

Peter J. Loewen[a,*], Christopher T. Dawes[b], Nina Mazar[c], Magnus Johannesson[d], Philipp Keollinger[e], and Patrik K.E. Magnusson[f]

[a]Department of Political Science, University of Toronto, 3294 Davis Building, Mississauga, Ontario L6L 1C6, Canada. E-mail: peter.loewen@utoronto.ca .

[b]Wilf Family Department of Politics, New York University, 19 W 4th St, 2nd Fl New York, NY 10012, E-mail: cdawes@nyu.edu

[c]Joseph L. Rotman School of Management, University of Toronto, 105 St. George Street, Toronto, ON, Canada M5S 3E6, E-mail: nina.mazar@rotman.utoronto.ca

[d]Stockholm School of Economics, P.O.Box 6501, Sveavägen 65 SE-113 83 Stockholm, E-mail: magnus.johannesson@hhs.se

[e]Department of Applied Economics, Erasmus School of Economics, 3000 DR Rotterdam, Rotterdam, Netherlands, E-mail: koellinger@ese.eur.nl

[f] Department of Medical Epidemiology and Biostatistics, Karolinska Institutet, SE-171 77, Stockholm, Sweden. E-mail: patrik.magnusson@ki.se

★This manuscript is accompanied by supplemental materials, consisting of two tables and one appendix.

*Corresponding author. P. J. Loewen, Phone: 647.232.7335

Forthcoming 2013 in the ***Journal of Economic Behavior and Organization (JEBO),*** special issue "Deception, Incentives and Behavior"

Abstract

Previous research on the acceptability of dishonest actions has focused on the role of social norms and internal reward mechanisms. Using a sample of over 2,000 Swedish adult twins, this manuscript examines whether there exists another source that is driving differences in perceptions of the acceptability of dishonest actions: genetic variation. We find that much of the variation in perceptions of the acceptability of dishonest actions is attributable to genetic variation between individuals.

Keywords

ethics, genetic, individual differences, heterogeneity, variation

1. Introduction

Individuals regularly commit dishonest actions, such as cheating on taxes, accepting bribes, skipping on public transit fares, and claiming sick days when they are not ill. While seemingly small in isolation, such actions impose substantial externalities. More than $1 trillion of global GDP is paid annually in bribes, to the detriment of economic growth (The World Bank, 2004). Governments lose trillions to tax evasion (Werdigier, 2011). Businesses are equally harmed, with as many as half of service sector employees in the United States committing theft against their companies (Wimbush & Dalton, 1997).

Why do some individuals feel it is acceptable to engage in everyday dishonesty while others do not? A standard economic model of dishonesty suggests that decisions to be dishonest are like any other decision; they are based on an analysis of the externally given costs such as the risks of being caught and magnitudes of punishments and the benefits of the dishonest act (Becker, 1968). Thus, to the extent that all individuals are selfish maximizers there should not be any individual differences. However, a more comprehensive rendering in the behavioral economics literature and related fields that considers individuals' social context and internal states suggests that factors such as identity (e.g. gender; see Croson & Gneezy, 2009; Dreber & Johannesson, 2008), cultural, social and religious norms (see e.g., Bénabou & Tirole, 2011; Mazar & Aggarwal, 2011), and people's internal reward mechanisms (for the role of consequences see Gneezy, 2005; Sutter, 2009; for justification and awareness see Mazar, Amir, & Ariely, 2008; Schweitzer and Hsee, 2002) shape individuals' decisions and behaviors and can lead to differences between individuals. For example, previous research has shown that feelings of unfairness in an interaction with another person or organization can lead individuals to

suspend their moral beliefs and willingly cause harm to the other party (Fehr, Kirchsteiger, & Riedl, 2003; Greenberg, 1990; Henrich et al., 2010).

Extending the existing body of work on individual differences in moral decision making, in this short note, we argue that heterogeneity in the perceptions of the acceptability of dishonest actions is the result not only of environmental differences, but also of a more fundamental difference: genetic variation between individuals. In doing so, we add to a growing body of evidence in related fields demonstrating that variation in a large number of individual preferences, behavior, and traits are attributable to genetic variation. Examples from economics include risk preferences (Cesarini et al 2009, 2010), preferences for fairness in an ultimatum game (Wallace et al 2007), and rates of cooperation in trust games (Cesarini et al 2008). Results from psychology and behavior genetics abound, such that *stylized* laws of behavior genetics have emerged (Turkheimer 2000), the first of which is that every behavioral outcome is heritable. However, to our knowledge, this is the first study to establish the heritability of moral standards.

Based on a classic twin study-design with over 2,000 Swedish adult twins, we show that genetic variation is a significant source of heterogeneity in perceptions of the acceptability of dishonest actions. Indeed, we find that nearly a third of the variance in such perceptions is attributable to genetic variation. In what follows, we discuss the design of our study, present our results, and discuss their implications.

2. Twin Study Design

A classic twin study design (for a review, see Benjamin et al., 2012) relies on the fact that Monozygotic (MZ) twins share ~100% of their genetic material while Dyzygotic (DZ)

twins share ~50% on average. Greater similarity of the behavior of MZ twins versus DZ twins can thus be attributed to genetic influences, provided the twins are drawn from a common environment.

We estimate heritability using a standard ACE model, where A estimates additive genetic effects, C estimates common environment effects (this includes the family environment in which both twins were raised and any other factor to which both twins were exposed, such as, for example, cultural norms) and E estimates unique environment effects (i.e. influences not correlated within twins) and noise. This method has enjoyed wide, fruitful use in the study of various behavioral and psychological traits (e.g., Bouchard et al., 1990; Plomin, 1990).

Since the ACE model requires strong functional form and independence assumptions, it has been the object of criticism (Kamin & Goldberger, 2002). A linear functional form implies that there are no gene-environment or gene-gene interactions. Violations of this assumption have implications for heritability estimates. A unique environment interaction downwardly biases heritability whereas a shared environment interaction upwardly biases heritability. An omitted gene-gene interaction upwardly biases heritability. The independence assumption implies there is no gene-environment correlation. Interactions can be incorporated into the ACE model (for example a GXE model), however, a hypothesis of how and why genes and environment interact, as well as a direct measures of environmental factors, is required.

The standard ACE model assumes random mating, which implies that DZ twins share on average 50% of their segregating genes. Assortative mating would increase the

resemblance of parents and thus DZ twins, meaning the estimate of heritability is downwardly biased.

The assumption that is the most controversial, however, is the equal environments assumption (EEA). Identification of the ACE model requires the assumption that differences in MZ and DZ twins for a particular trait are not due to similarity in the exogenous environmental conditions facing MZ twins. Based on this definition, exposure to environmental conditions that are the result of genetic endowments does not violate the EEA. For example, MZ twins may be treated more similarly by others than DZ twins because they look alike. MZ twins may also select into more similar environments due to their genetic similarity. However, the EEA is violated if genetic similarity affects within-pair behavior. This would be the case, for example, if due to genetic similarity an MZ twin became better at playing the piano by observing their sibling's experiences than a DZ twin would (see Benjamin et al. 2012). In terms of ACE model estimates, a violation of the EEA would mean that the estimate of genetic influence was overstated and the estimate of common environmental influence was understated.

One way to theoretically avoid relying on the EEA is to analyze twins reared apart since by definition there would be no shared environmental factors. However, studies of twins reared apart yield similar heritability estimates for cognitive ability and personality traits (Bouchard et al., 1990) suggesting that the EEA is valid for those traits. In addition, scholars have attempted to test the EEA by comparing the similarity of twins as a function of perceived rather than actual zygosity. The EEA suggests that only actual zygosity should matter, which has been shown to be the case for intelligence, social

attitudes, personality, and psychiatric disorders (Scarr 1968, Scarr & Carter-Saltzman 1979; Kendler et al.,1993; Xian et al. 2000).

3. Procedure

We queried 2,273 individuals that belonged to a same-sex twin pair from the Swedish twin registry (45.8% males; *M*(age) = 60, *SE* = 0.05) on the acceptability of four everyday dishonest behaviors: claiming sick benefits while healthy (1.4% thought it totally or fairly acceptable), avoiding paying for public transit (2.8% thought it totally or fairly acceptable), avoiding paying taxes (9.7% thought it totally or fairly acceptable), and accepting bribes on the job (6.4% thought it totally or fairly acceptable). Internal consistency between these measures was relatively high (Cronbach's alpha=.68). As previous work suggests other factors which explain variation in moral standards, we also queried participants regarding their general risk preference, their sense of economic fairness, their religiosity, locus of control, behavioral inhibition, voluntary and charitable activity, and basic sociodemographics to assess to what extent those factors correlated with the acceptability of dishonest actions in our sample (for survey question wordings and answer scales see Appendix A in the Supplementary Material).

4. Results

Our outcome of interest is the extent to which individuals agree that various actions are dishonest is attributable to genetic variation. Since the frequency of responses indicating dishonesty was low and non-normally distributed, we performed a principal components factor analysis on respondents' answers to each dishonesty item. As the items all loaded

strongly on a single dimension, we took the predicted score from this dimension as a latent measure of a respondent's assessment of the acceptability of dishonest actions.[1] We called this our Acceptability Score. This measure was related to a number of the additionally assessed factors suggested by previous work on sources of individual variation in moral standards. Significant correlations were exhibited for age (r=.10, p=.00), sex (r=.12, p=.00), religiosity (r=.06, p=.00), preferences for risk (r=-.09, p=.00) and fairness (r=-.10, p=.00), locus of control (r=-.03, p=.01), and charitable giving (r=.09, p=.00). However, these significant correlations were relatively weak, suggesting that our measure is not merely standing in for these demographic and psychological differences between individuals. There were no significant correlations with behavioral inhibition (r=-.00, p=.81) or volunteering (r=.01, p=.29). Table S1 presents all pairwise correlations.

Since the ACE model has been shown to produce reliable estimates (see section 2 of the paper) as a first step in understanding the genetic contribution to judgments and beahvior, we estimated heritability using a standard ACE model. As can be seen in Table 1, estimates of heritability for assessments of the acceptability of each dishonest action ranged from 26% (95% CI 10%, 33%) for avoiding taxes to 42.5% (95% CI 10%, 59%) for claiming unnecessary sick leave. The heritability for the Acceptability Score was estimated at 32% (95% CI 26%, 37%; polychoric within-twin correlations also support our results, see Table S2 in the Supplementary Material). The remaining variance was explained by unique environment. We used a standard Akaike information criteria

[1] The eigenvalue for the first dimension was 2.14. The eigenvalue on the second dimension was 0.79. The first dimension explained 53% of the variance. Factor loadings were .68 for cheating on taxes, .71 for bribery, .73 for claiming sick days, and .80 for skipping on public transit fares.

approach to determine the best-fitting empirical model. The best-fitting model suggested that common environment explained no variance. Moreover, as can be seen from the sex-limitation estimates in Table 1, model fit could not be improved by estimating separate models by sex.

Table 1. Estimates of the Heritability of Everyday Dishonest Actions

Variable	A (95% CI)	C (95% CI)	E (95% CI)	-2*LL	Sex Limitation *p*-value
Sick benefits	0.425 (0.100, 0.590)	0.000 (0.000, 0.239)	0.575 (0.410, 0.763)	2141.720	0.515
Transportation	0.423 (0.197, 0.495)	0.000 (0.000, 0.180)	0.577 (0.505, 0.659)	7082.669	0.256
Avoid taxes	0.263 (0.095, 0.325)	0.000 (0.000, 0.133)	0.737 (0.675, 0.802)	11077.137	0.378
Accept bribe	0.397 (0.222, 0.467)	0.000 (0.000,0.138)	0.603 (0.533, 0.678)	7866.381	0.988
Acceptability Score	0.324 (0.259, 0.373)	0.000 (0.000, 0.042)	0.676 (0.627, 0.728)	12366.424	0.353

Note: The table presents estimates of additive genetic effect (A), the shared environment effect (C), and the unique environment effect (E) with 95% confidence intervals (CI) in parentheses. Models were estimated using MX. The minimum number of respondents was: 436 male MZ, 463 male DZ, 619 female MZ, 639 female DZ twins. -2*LL reports the log-likelihood of the model. Variance components were constrained to be the same in men and women. The sex limitation *p*-value tests for the null-hypothesis that a sex limitation model fits the data better than a pooled model.

5. Discussion

Recent research on dishonesty in the behavioral economics literature and related fields suggest that identity, the social context, and internal reward mechanisms matter for individuals' actions (e.g., Bénabou & Tirole, 2011; Croson & Gneezy, 2009; Mazar, Amir, & Ariely, 2008). Our work extends the current body of knowledge on dishonest behavior by demonstrating that variance between individuals in perceptions of the acceptability of certain everyday dishonest activities has a genetic component. In addition,

this component is conceptually and empirically largely independent of some of the factors often implicated in people's decisions about immoral behaviors such as sex, religiosity, risk and fairness preferences, socioeconomic factors, and other individual differences. Finally, the heterogeneity in the perceptions of the acceptability of dishonest actions in our sample does not appear to be influenced by the common environment shared by twin pairs, suggesting that the influence exerted by the environment occurs through individual, unique experiences.

Our work has three limitations, each of which offers interesting avenues for future research. First, we rely on self-reports of the acceptability of dishonest actions, a second best to an observation of actual dishonest actions. While future innovative data collection strategies could provide data on actual dishonest action, our findings are still of interest to the extent that reported perceptions of the acceptability of dishonest actions affect judgments and decision-making or accurately map onto real dishonest behavior. The later assumption should be tested, however, as dishonest individuals may very well misreport the acceptability of dishonest behavior in a manner different than honest individuals. Strategic misreporting of this sort could potentially bias our results. Second, while our work parameterizes the amount of variance attributable to genes, it does not point to obvious policy corrections (Manski, 2011). After all, our findings do not assert that genes determine behavior. Identifying effective responses to genetic variation in assessments of dishonesty likely requires a better understanding of what biological and psychological mechanisms lead from such assessments to actual dishonest behavior. Second, our results are obtained over a limited participant age range. As the comparative influence of genes and environment can change over the life cycle (e.g., Bergen, Gardner,

& Kendler, 2007) future work could replicate our findings over a wider age range to better understand how age interacts with the influence of genetic variation. Third, our work is based on data from a single country with well-developed social norms towards fairness (Rothstein, 1998). The lack of a common environment-influence on assessments of dishonest behavior may well be attributable to a lack of variance in social norms. Replication in other countries should occur, as the exact role and extent of genetic and common environment-influence could change in different national and cultural contexts. Such a multi-country approach could thus offer some clues on the generalizability of our findings.

References

Becker, G. S., 1968. Crime and punishment: An economic approach. Journal of Political Economy, 76, 169–217.

Bénabou, R., & J. Tirole, 2011. Identity, Morals and Taboos: Beliefs as Assets. The Quarterly Journal of Economics, 126, 805–855.

Benjamin, D.J., D. Cesarini, C.F. Chabris, E.L. Glaeser, D.I. Laibson, V. Guðnason, T.B. Harris, L.J. Launer, S. Purcell, A.V. Smith, M. Johannesson, P.K.E. Magnusson, J.P. Beauchamp, N.A. Christakis, C.S. Atwood, B.M. Hebert, J. Freese, R.M. Hauser, T.S. Hauser, A. Grankvist, C.M. Hultman & P. Lichtenstein, 2012. The Promises and Pitfalls and Genoeconomics. Annual Review of Economics, 4, 627-662.

Bergen, S. E., Gardner, C. O., & Kendler, K. S., 2007. Age-related changes in heritability of behavioral phenotypes over adolescence andyoung adulthood: A meta-analysis. Twin Research and Human Genetics, 10, 423–433.

Bouchard, T.J., Lykken, D.T., McGue, M., Segal, N.L., & Tellegen, A., 1990. Sources of human psychological differences: the Minnesota study of twins reared apart. Science, 250*,* 223–228.

Cesarini D, Dawes CT, Fowler J, Johannesson M, Lichtenstein P, Wallace B., 2008. Heritability of Cooperative Behavior in the Trust Game. Proceedings of the National Academy of Sciences. 105: 3271-3276

Cesarini D, Dawes CT, Johannesson M, Lichtenstein P, Wallace B., 2009. Genetic Variation in Preferences for Giving and Risk-Taking. Quarterly Journal of Economics. 124(2): 809- 842

Cesarini D, Johannesson M, Lichtenstein P, Sandewall O, Wallace B. 2010., Genetic Variation in Financial Decision Making. Journal of Finance. 65(5): 1725-1754.

Croson, R., U. Gneezy. 2009. Gender differences in preferences. Journal of Economic Literature, 47(2), 448–474.

Dreber, A., M. Johannesson. 2008. Gender differences in deception. Economic Letters, 99(1), 197–199.

Fehr, E., G. Kirchsteiger, & A. Riedl, 1993. Does fairness prevent market clearing? An experimental investigation. The Quarterly Journal of Economics, 108, 437–459.

Gneezy, U., 2005. Deception: The role of consequences. American Economic Review, 95, 384–394.

Greenberg, J., 1990. Employee theft as a reaction to underpayment inequity: The hidden cost of pay cuts. Journal of Applied Psychology, 75, 561–568.

Henrich, J., Ensminger, J., McElreath, R., Barr, A., Barrett, C., & Ziker, J., 2010. Markets, religion, community size, and the evolution of fairness and punishment. Science, 327, 1480–1484.

Kendler, K. S., Kessler, R. C., Neale, M. C., Heath, A. C., & Eaves, L. J., 1993. The prediction of major depression in women: toward an integrated etiologic model. American Journal of Psychiatry, 150, 1139-1139.

Kamin, L. J., & Goldberger, A. S., 2002. Twin studies in behavioral research: a skeptical view. Theoretical Population Biology, 61, 83-95.

Liang, K.-Y. & Zeger, S. L., 1986. Longitudinal data analysis using generalized linear models. Biometrika, 73, 13–22.

Manski C. 2011. Genes, Eyeglasses, and Social Policy. Journal of Economic Perspectives. 25(4): 83-94

Mazar, N. & Aggarwal, P., 2011. Greasing the palm: Can collectivism promote bribery? Psychological Science, 22, 843–848.

Mazar, N., Amir, O., & Ariely, D., 2008. The dishonesty of honest people: A theory of self-concept maintenance. Journal of Marketing Research, 45, 633–644.

Plomin, R., 1990. The role of inheritance in behavior. Science, 248, 183–248.

Rothstein, B., 1998. Just Institutions Matter: The Moral and Political Logic of the Universal Welfare State. Cambridge: Cambridge University Press.

Scarr, S., 1968. Environmental bias in twin studies. Biodemography and Social Biology, 15, 34-40.

Scarr, S., and Carter-Saltzman, L., 1979. Twin method: Defense of a critical assumption.

Behavior Genetics, 9, 527-542.

Schweitzer, M. E. & Hsee, C. K., 2002. Stretching the Truth: Elastic Justification and Motivated Communication of Uncertain Information. Journal of Risk and Uncertainty, 25, 185–201.

Sutter, M. 2009. Deception through telling the truth? Experimental evidence from individuals and teams. Economic Journal, 119(534), 47–60.

Turkheimer E., 2000. Three laws of behavior genetics and what they mean. Current Directions in Psychological Science. 9: 160–164

Wallace B, Cesarini D, Lichtenstein P, Johannesson M. 2007., Heritability of Ultimatum Game Responder Behavior. Proceedings of the National Academy of Sciences. 104: 15631- 15634

Werdigier, J., 2011. Tax Evasion Costs Governments $3.1 Trillion Annually, Report Says. The New York Times, Nov 28, 2011. Retrieved from http://www.nytimes.com/2011/11/26/business/global/26iht-tax26.html.

Wimbush, J.C. & Dalton, D.R., 1997. Base rate for employee theft: Convergence of multiple methods. Journal of Applied Psychology, 82, 756–763.

The World Bank., 2004. The costs of corruption. Retrieved from http://go.worldbank.org/VAT2EY5A00.

Xian, H., Chantarujikapong, S. I., Scherrer, J. F., Eisen, S. A., Lyons, M. J., Goldberg, J., True, W. R., 2000. Genetic and environmental influences on posttraumatic stress disorder, alcohol and drug dependence in twin pairs. Drug and alcohol dependence, 61, 95-102.

Appendix A

Survey Question Wordings and Answer Scales

1. Survey Question Wordings

All questions are presented as translated from Swedish.

Our four dishonest actions were measured using the following wording. "Mark below how acceptable or unacceptable you think the actions below are:"

1. "To claim sick benefits without being sick." (M = 3.9, SE = 0.005)
2. "To avoid paying for public transit." (M = 3.6, SE = 0.009)
3. "To avoid paying taxes if given the opportunity." (M = 3.1, SE = 0.013)
4. "To accept a bribe on the job." (M = 3.5, SE = 0.01)

For each item, respondents could indicate if the action was *1:totally acceptable*, *2:fairly acceptable*, *3:neither acceptable nor unacceptable*, *4:fairly unacceptable*, or *5:totally unacceptable*.

Score is a factor score from the first dimension of a principal components factor analysis of the sum of all four dishonesty items. (M = 0.00, SE=0.01.)

Religiosity: "Generally speaking, how religious would you say you are?" Respondents were asked to indicate their response on a four point scale: *1: No religious faith, 2: Not particularly religious, 3: Fairly religious, 4: Very religious.* (M=1.97 , SE=0.01).

Age: Contained in subject records. (M = 60, SE = 0.05)

Gender: Contained in subject records. 45.8% of subjects are males.

Risk preference: "How do you see yourself: are you *generally* a person that is fully prepared to take risks or do you try to avoid taking risks?" Respondents were asked to indicate their answer on an 11-point scale ranging from *0:unwilling to take risks* to *10:fully prepared to take risks* ($M = 4.5$, $SE = 0.03$).

Sense of Economic Fairness was measured using the following three questions:

1. "A hardware store has been selling snow shovels for SEK 150. The morning after a large snowstorm the store raises the price to SEK 200. How fair do you think that is?" ($M = 2.76$, $SE = 0.01$)
2. "A company is making a small profit. However, due to a recession the unemployment is high and it is easy to hire people. The company therefore decides to decrease wages and salaries by 10% for all its employees. How fair do you think that is?" ($M = 3.09$, $SE = 0.01$)
3. "A small factory is making kitchen tables. Because of changes in the price of materials, the cost of making each table has decreased by SEK 200. But the factory does not lower its price for the tables. How fair do you think that is?" ($M = 2.36$, $SE = 0.01$)

Each question had four response categories: *1:completely fair*, *2:acceptable*, *3:unfair*, and *4:very unfair*. All three questions were reverse coded and the sense of economic fairness measure was the sum of responses to all three (Cronbach's alpha = 0.55; $M = 6.8$, $SE = 0.02$; scale from 3 to 9).

Locus of control: Measured using a 13-item scale. Subjects were asked "Please choose one choice (a or b) for each number: *1. a. Children get into trouble because their patents punish them too much. 1. b. The trouble with most children nowadays is that their parents are too easy with*

them. 2. a. Many of the unhappy things in people's lives are partly due to bad luck. 2. b. People's misfortunes result from the mistakes they make. 3. a. One of the major reasons why we have wars is because people don't take enough interest in politics. 3. b. There will always be wars, no matter how hard people try to prevent them. 4. a. In the long run people get the respect they deserve in this world. 4. b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries. 5. a. The idea that teachers are unfair to students is nonsense.5. b. Most students don't realize the extent to which their grades are influenced by accidental happenings. 6. a. Without the right breaks, one cannot be an effective leader. 6. b. Capable people who fail to become leaders have not taken advantage of their opportunities. 7. a. No matter how hard you try, some people just don't like you. 7. b. People who can't get others to like them don't understand how to get along with others. 8. a. Heredity plays the major role in determining one's personality. 8. b. It is one's experiences in life which determine what they're like. 9. a. I have often found that what is going to happen will happen. 9. b. Trusting fate has never turned out as well for me as making a decision to take a definite course of action. 10. a. In the case of the well prepared student there is rarely, if ever, such a thing as an unfair test. 10. b. Many times, exam questions tend to be so unrelated to course work that studying in really useless. 11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it. 11. b. Getting a good job depends mainly on being in the right place at the right time. 12. a. The average citizen can have an influence in government decisions.12. b. This world is run by the few people in power, and there is not much the little guy can do about it. 13. a. When I make plans, I am almost certain that I can make them work. 13. b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

1 point was given to each of the following responses: ‘a’ to questions 1, 3, 4, 5, 10, 11 and 12’ ‘b’ to questions 2, 6, 7, 8, and 9. Score ranges from 0 to 13. (M=5.79, SE=0.04)

Adult Measure of Behavioral Inhibition: For each of the following eleven items, subjects were asked: “When you enter a new or unfamiliar social situation or whenever you are faced with new and unfamiliar surroundings or people”: *1. Do you tend to become vigilant and wary of your surroundings?; 2. Do you feel awkward when you are approached by someone new?; 3. Do you tend to become quiet?; 4. Do you tend to approach people whom you don’t know and talk to them?; 5. Do you tend to spend time observing strangers from a distance first, before being able to mix in?; 6. Do you tend to be chatty in conversation when you are speaking to someone new?; 7. Are you likely to spend most of your time next to a person whom you know well?; 8. Do you tend to feel physically anxious (e.g. racing pulse, sweaty, butterflies)?; 9. Do you tend to introduce yourself to new people?; 10. Do you tend to keep a fair distance away from strangers?; 11. Do you tend to withdraw and retreat from those around you?*. For each of the following five items, subjects were asked: “Generally, not just in new or unfamiliar situations:” *12. Do you prefer your own company over the company of others?; 13. Do you usually enjoy going to social events with large crowds of people?; 14. Would you tend to choose solitary leisure activities over spending time with close friends?; 15. Do you prefer to be surrounded by lively activity rather than a quiet gathering?; 16. If physically able, would you enjoy adventure holidays with some element of risk?. All questions were rated on a 3-point scale: 0: no/hardly ever; 1: some of the time, or 2: yes/most of the time.*

Negative item were reversed and all scores summed to generate a score between 0 and 51. (M=14.6, SE=0.07.)

Charity: "How much money to you give to charity?" Respondents were asked to indicate their response on a seven point scale: *1: SEK 0 per year, 2: Less than 100 SEK per year, 3: SEK 100-500 per year, 4: SEK 500-1000 per year, 5: SEK 1000-3000 per year, 6: SEK 3000-5000 per year, 7: More than SEK 5000 per year.* (*M=3.47 , SE=0.02).*

Volunteer: "How much time do you devote to unpaid voluntary work, for instance in a society?" Respondents were asked to indicate their response on a six point scale: *1: 0 hours per week, 2: Less than hour per week, 3: 1-2 hours per week, 4: 2-5 hours per week, 5: 5-10 hours per week, 6: More than 10 hours per week.* (*M=1.85 , SE=0.02).*

Table S1. Pairwise correlation matrix of key variables

	Score	Sick	Transport	Taxes	Bribe	Religiosity	Age	Sex	Risk	Fairness	Locus of control	Adult measure of behavioral inhibition	Charity	Volunteer
Score	1													
Sick	.73	1												
	.00													
Transport	.80	.53	1											
	.00	.00												
Taxes	.69	.27	.41	1										
	.00	.00	.00											
Bribe	.72	.36	.39	.40	1									
	.00	.00	.00	.00										
Religiosity	.06	.00	.05	.08	.04	1								
	.00	.70	.00	.00	.00									
Age	.10	.02	.15	.05	.05	.04	1							
	.00	.04	.00	.00	.00	.00								
Sex	.12	.03	.05	.19	.10	.11	-.02	1						
	.00	.01	.00	.00	.00	.00	.17							
Risk	-.10	-.02	-.10	-.11	-.06	.01	-.10	-.13	1					
	.00	.18	.00	.00	.00	.49	.00	.00						
Fairness	-.10	-.02	-.07	-.13	-.07	.03	-.02	-.18	.13	1				
	.00	.11	.00	.00	.00	.01	.09	.00	.00					
Locus of control	-.03	-.02	-.01	.01	-.08	-.02	.00	.10	-.12	-.15	1			
	.01	.10	.44	.25	.00	.10	.95	.00	.00	.00				
Adult measure of behavioral inhibition	.00	-.03	.01	.02	-.02	.00	.07	.05	-.29	-.13	.31	1		
	.81	.01	.25	.06	.12	.94	.00	.00	.00	.00	.00			
Charity	.09	.05	.06	.07	.09	.22	.03	.05	.06	.07	-.10	-.12	1	
	.00	.00	.00	.00	.00	.00	.03	.00	.00	.00	.00	.00		
Volunteer	.01	.02	.02	-.01	.01	.17	.07	-.17	.15	.09	-.10	-.15	.18	1
	.29	.20	.16	.55	.42	.00	.00	.00	.00	.00	.00	.00	.00	

Note: This table reports pairwise correlation coefficients between our key variables. *P*-values are reported below each coefficient.

Table S2. Polychoric Within-Twin Correlations

Variable	MZ (95% CI)	DZ (95% CI)	DIFF	*p*	N
Sick benefits	0.43 (0.24, 0.59)	0.01 (-0.84, 0.26)	0.43	0.00	2,273
Transportation	0.41 (0.32, 0.49)	0.22 (0.13, 0.31)	0.19	0.00	2,273
Avoid taxes	0.30 (0.23, 0.37)	0.17 (0.09, 0.24)	0.14	0.00	2,273
Accept bribe	0.42 (0.34, 0.50)	0.19 (0.11, 0.26)	0.23	0.00	2,273
Score	0.33 (0.27, 0.38)	0.17 (0.12, 0.23)	0.15	0.00	2,273

Note: This table reports the polychoric within twin correlations for each surveyed dishonest action, as well as the Score measure with 95% confidence intervals (CI) in parentheses. The DIFF and *p* columns report the difference between the correlations and the significance of this difference, according to 1000 bootstraps. For each variable, the correlation (i.e. concordance in assessments of the acceptability of dishonest actions) between Monozygotic twins is significantly higher than that among Dyzygotic twins.