Original Papers

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The strength of emotions in moral judgment and decision-making under risk

The focus of this paper is the role of emotions in judgments and choices associated with moral issues. Study 1 shows that depending on the strength of emotions when making a moral decision, people become sensitive to the severity and the probability of harm that their decisions can bring to others. A possible interpretation is that depending on the strength of emotions, people in their moral judgments choose to be either utilitarian or deontologist. In Study 2, following the priority heuristic model, we found that in situations in which the violation of moral norms does not evoke strong negative emotions, people are sensitive to quantitative risk parameters (probabilities and outcomes), and the decision-making process requires a relatively longer time. In moral situations in which a violation of the moral norm evokes strong emotions, decision-making is based on arguments other than quantitative risk parameters, and the process takes a shorter time.

Keywords: *moral judgment, moral choice, moral emotions, judgment and choice under risk*

Introduction

In real life people often face problems and have to make decisions associated simultaneously with different types of consequences (financial, social, moral etc). An example can be a dilemma that results in both material and moral outcomes. For instance, many choices that are made in business entail not only financial outcomes (profit or loss), but also moral outcomes (negative consequences for employees). Let us consider the following scenario:

Recently, controllers have advised an owner of a factory to introduce some safety changes because the present technical state can be dangerous for workers. However, the owner has some financial problems and she is considering two options: (1) to introduce the changes immediately or (2) to postpone the introduction of changes.

Table 1 distinguishes between the two types of consequences faced by the factory owner described in the above scenario: personal material consequences and moral consequences. Moreover, at least some of these consequences (material and/or moral) might be uncertain. A person who makes the decision about the present problem must consider both types of outcomes and possibly trade off between them. Two questions – related though different –

might be raised here. One of them concerns the way people make moral judgments: in what way they assess whether violating moral norms is admissible (e.g. the postponement of the introduction of the safety changes in the above example). Another question concerns the problem of how the decision associated with moral issues is made, i.e. how the decision-makers solve the conflict between material and moral values.

The present paper shows the results of a research project that addressed both questions. In particular, it focuses on the problem of whether and to what degree people are sensitive to changes in probability and magnitude of consequences of considered actions. In case of moral judgments we tested whether people are sensitive to the severity and probability of moral consequences (i.e., consequences causing the harm to others). In case of economic decisions associated with moral issues, we tested whether people are sensitive to changes in the value of material outcomes and their probabilities. Because a considerable amount of studies documented that emotions play a critical role in moral judgments and choices, our research result presentation starts by showing how people affectively evaluate problems that entail both financial and moral consequences. Then, we demonstrate how these affective evaluations are related

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Table 1
Material and moral consequences associated with the dilemma of the factory owner.

	Personal material consequences	Moral consequences
Option 1: Immediate introduction of changes	Increase of costs; Avoiding penalty	No harm for workers
Option 2: Introduction of changes postponed	Saving costs; Penalty risk	Risk of workers' accidents or injuries

to people's sensitivity to changes in the probability and magnitude of both moral and material consequences.

During the last decade, since the publication of the seminal paper by Haidt (2001), a close relationship between emotions and moral judgments has been demonstrated by a great deal of empirical evidence. Haidt's main argument was that people are often unable to formulate a rational basis for strongly held moral convictions (see also Bjorklund, Haidt, & Murphy, 2000; Cushman, Young, & Hauser, 2006; Hauser, Cushman, Young, Jin, & Mikhail, 2007). Another type of evidence demonstrating that moral judgments are driven by emotional responses comes from neuroimaging and neuropsychological studies (Ciaramelli, Muccioli, Ladavas, & di Pellegrino, 2007; Greene, Nystrom, Engell, Darley, & Cohen, 2004; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Koenigs et al., 2007; Mendez, Anderson, & Shapria, 2005) which show that making moral judgments is accompanied by increased activity of the brain structures associated with affective experiences. Finally, behavioral studies demonstrate that using affective manipulations (e.g. introducing disgust) may modify moral judgments (Valdesolo & DeSteno, 2006; Schnall, Haidt, Clore, & Jordan, 2008; Wheatley & Haidt, 2005). Although the relationship between emotions and moral judgments is uncontroversial, there is still a debate whether emotions should be considered a source of intuitive moral judgments or whether the source of moral judgments lies in deliberative cognitive processes, and emotions just follow moral judgments (Huebner et al. 2008).

The research on the relationship between emotions and moral judgments is most frequently based on the so-called moral dilemmas, where subjects were confronted with an option of harming one person, but saving lives of more people. Probably the best known example of such a study is the trolley dilemma (see Foot, 1967), where an individual sees a trolley running out-of-control straight in the direction of five people who are walking along the track. The main track has a side track on which a single person is working. The individual must decide whether to divert the trolley to the side track, which will kill one person but save five. This dilemma refers to a controversy among moral philosophers about the nature of moral judgments. For many centuries moral philosophers have represented either a consequentialistic (utilitarian) or a deontological approach to moral norms. Consequentialists hold that what is morally right or wrong depends on the consequences of an act. Deontologists, on the other hand, assume that consequences do not matter, since some acts are

intrinsically wrong and cannot be justified by the goodness of their outcomes (Scheffler, 1988).

Using experimental tasks such as the trolley dilemma, the researchers focused on the question of people becoming utilitarians or deontologists in their moral judgments. The results of these experiments showed that people's choices were mostly of the utilitarian type, i.e. people were ready to accept killing one person in order to save five (Greene et al., 2001; Hauser, 2007). However, people's utilitarian attitude tended to change into deontological, when the trolley dilemma was slightly modified into the so-called footbridge problem. The situation in this dilemma is quite similar to the trolley case, except that the only way to save the five people is to push a large stranger off the footbridge in front of the oncoming vehicle, which will stop the trolley but kill the stranger. Again, the individual must decide whether to push the stranger off, thus killing one person but saving five. Several studies have demonstrated that in the latter case, and generally when strong emotions are triggered by the dilemma, individuals tend to assume the deontological position (e.g. Blair, 1995; Hauser, Cushman, Young, Jin, & Mikhail, 2007; Greene et al., 2001; Nichols & Mallon, 2006).

Greene et al. (2001; 2008) argue that the footbridge case is more 'personal' and therefore it generates stronger affect than the trolley dilemma. Consequently, they claim that whether an individual reveals a utilitarian or a deontological position depends on the strength of the emotion triggered by the dilemma. Greene et al. (2001, 2008) proposed a dual-process theory of moral judgments according to which these judgments can be controlled either by cognitive processes or by affect. In situations where an act does not elicit strong negative emotions, people act as utilitarians, i.e. they compare the consequences of the alternatives and choose the one which maximizes utility. On the other hand, when an act elicits a strong negative emotion, an automatic emotional response is evoked and people tend to demonstrate deontological behavior.

If this theory is true, one can speculate even further that in situations where an act does not elicit strong negative emotions, the individual should take into account not only the moral value of the consequences, but also the probability that such consequences will occur. There are indeed numerous examples of moral choices that do not necessarily have to harm others, but only involve some risk of harm. For example, when drivers considerably exceed the speed limit in a built-up area, they can injure or even kill pedestrians. But this is by no means certain – an accident is

only more or less probable to happen. In accordance with modern decision theory, the decision maker in such a risky situation should take into account not only the value of the consequences, but also the probability of their occurrence.

In experiments using different moral dilemmas researchers focused exclusively on the amount of harm that affected others (e.g. killing one versus five people). Such approach ignored the question of the probability of these consequences. In the research presented here, we decided to test the dual-process hypothesis by Greene et al. (2001; 2008), introducing to the experimental situation the element of the uncertainty of potential consequences. We assumed that while considering whether to take an action that can harm others, people take into account not only the amount of moral consequences of the action (harm to others) but also the probability of the harmful effect. Thus, in accordance with the dual-process theory by Greene et al. (2001; 2008), we arrived at the following hypothesis:

In situations when violating a moral norm evokes weak moral emotions, moral judgments will be sensitive to changes in the (negative) values of moral consequences and their probabilities, while in situations when violating a moral norm evokes strong moral emotions moral judgments will not depend on these parameters.

Whatever the nature of moral judgments, there is a question researchers rarely focus on: how the decision maker's self-interest is combined with the moral aspects of the decision process? As Altman (2005) pointed out, the neoclassical economic theory generally neglected this moral dimension of human decision-making. It was rather assumed that economic agents are entirely self-interested and strive to maximize their own material well-being. On the other hand, the decision theorists usually hold that moral attributes can be incorporated into expected-utility models. Indeed, if a decision-maker places a positive value on moral aspects of behavior (i.e. on the well-being of others), her or his utility function may be expressed as follows: *(1-a) $u_s (x) + a\, u_m (x)$*, where u_s (x) is the decision-maker's own benefit accruing from outcome x, u_m (x) is the utility of moral aspects, and *a* expresses the decision-maker's concern for moral considerations.

According to this approach, choosing among alternatives with moral aspects might be considered as a choice among multi-attribute alternatives, where the decision maker trades off between material and moral payoffs. Nevertheless, some difficulties are associated with this approach. First, studies (e.g., Montgomery, 1983) show that decision-makers generally avoid trade-offs. In the case of decisions involving moral consequences, this is even more compelling. Research shows that people may even regard trade-offs requiring the comparison of some moral and monetary values as impermissible. Fiske and Tetlock (1997) called such cases 'taboo trade-offs', and Baron and Spranca (1997) proposed the term 'protected

values'. Moreover, one may question whether a decision-maker always has clear views on how much weight should be attached to moral concerns and how much to material aspects.

Thus, decision-makers may tend to solve the conflict between their moral sentiments (guilt, gratitude, etc.) and their economic self-interest without making trade-offs between the two. In particular, when a moral norm is strong enough (involves sufficiently strong moral commitments), people can follow the norm even without any consideration of material payoffs. Adam Smith argued that such decisions are based on moral sentiments, no matter how much the given choice opposes one's economic self-interest. He wrote: *The poor man must neither defraud nor steal from the rich, though the acquisition might be much more beneficial to the one than the loss could be hurtful to the other* (Smith, 1759/2006, p. 121). Instead of trade-offs, Smith evidently suggests the application of the lexicographic decision rule to solve the conflict between moral and economic self-interest. However, it is well known that this conflict is not always solved in favor of the moral sentiment. Quite often it is the economic self-interest that takes over. We think that the adequate model of decision making under conflict between moral and economic values might be the priority heuristic proposed by Brandstätter, Gigerenzer and Hertwig (2006). Their priority heuristic model specifies: (1) the order of priority of examining aspects of the situation, (2) a stopping rule, determining when to stop examining the alternatives, and (3) a decision rule determining which alternative should be chosen. The authors propose the priority heuristic as an alternative to the assumption of trade-offs between values, however they also claim that people neither always make trade-offs in their choices, nor that they never make them.

Following this way of thinking we propose that in the context of decisions associated with moral questions this model may be described as follows. When decision-makers face a decision that entails moral consequences, they first examine the moral consequences of the considered action. When the sentiment associated with violating a moral rule involved in the action is strong enough, then the material consequences of the alternative are not examined at all and the decision to reject the action is taken (usually in a very short time).

However, when the sentiment associated with violating a moral rule is not strong enough, both material and moral consequences are considered. A multi-attribute utility-maximization decision rule is applied. The utility function takes the following general form:

(1-a) $u_s (x) + a\, u_m (x)$,

where u_s *(x)* is the decision-maker's benefit from outcome x, and u_m *(x)* is the utility of the moral aspects. Factor *a* expresses the decision-maker's concern for the moral aspects, and its value depends on the strength of the

moral norm involved. Naturally, when the consequences of an alternative are uncertain, the outcomes should be weighted by corresponding subjective probabilities.

Testing such a model is not an easy task. In the present research we decided to test only one of its qualitative consequences. Namely the following one:

When a violation of the norm does not evoke strong emotions, the decision-maker should be sensitive to the severity and probability of decision outcomes, which is consistent with the trade-off principle. On the other hand, when a violation of the norm evokes strong affect, decision-making will be based on arguments different from quantitative risk parameters, and therefore the decision-maker will not be sensitive to the severity and probability of the decision outcomes.

Overview of the Studies

The empirical part of this paper presents results of three experiments. In a preliminary experiment a sample of participants rated the strength of affective reactions evoked by the violation of four moral norms. The purpose of this experiment was to identify scenarios in which the violation of moral norms evokes weaker versus stronger negative emotions. In Study 1 we examined moral judgments as a function of both severity and probability of moral consequences (the harm brought to others), under stronger versus weaker affect evoked by the violation of a moral norm. Finally, in Study 2 we examined how people solve the conflict between moral values and economic self-interest under stronger versus weaker affect evoked by the violation of a moral norm.

Preliminary Study: Moral Emotions

The purpose of the Preliminary Study was to identify scenarios in which the violation of moral norms evokes weaker versus stronger negative emotions.

Method

Four scenarios were used in this study. All of them involved a trade-off between money and a moral norm. The characters described in the scenarios can make money on condition of breaking a moral norm. The following four scenarios were used.

Scenario A – Wallet:

Person A faces severe financial problems because he has been fired, has large debts and must provide for a big family. He finds a wallet on the street, containing a substantial sum of money. The owner's name and address are in the wallet. However, Person A can easily keep the wallet instead of returning it to the owner.

Scenario B – Safety:

Person B is the owner of a medium-sized factory.

Inspectors have ordered him to introduce technology that will improve workers' safety. However, B has financial problems and considers postponing these changes in order to avoid increased costs.

Scenario C – Product:

Person C manages a soft-drink company. He has discovered that a large batch of drinks is slightly contaminated and can be harmful to consumer health. However, in the event of an inspection, the contamination will be very hard to detect. If C decides not to sell the drinks, the company will lose substantial money, so he weighs whether to sell the drinks.

Scenario D – Bribe:

Person D is a policeman on routine patrol. He has stopped a driver who seems to have drunk some alcohol. The tipsy driver asks the policeman to treat him leniently and let him go. The driver also offers money in return. Policeman D considers whether to accept the money offered by the tipsy driver and let him go.

The participants' task was to indicate their affective reactions to the immoral behaviors described in the scenarios. Two groups of people participated in the study. Participants in the first group were asked to imagine that they had been themselves engaged in the scenarios presented to them and that they had decided to behave immorally (e.g., to keep the wallet found on the street). The participants' task was to evaluate how much guilt, shame or embarrassment (e.g., self-oriented moral emotions) they would feel if they had been the characters. The evaluations associated with the three emotions were performed on separate scales, ranging from 0 ("none") to 100 ("very strong"), at intervals of 5 points.

Participants in the second group were given the same four scenarios but were asked to imagine that they had observed the immoral behavior of the scenario characters. The task was to evaluate, on three separate 100-point scales, the levels of anger, disgust and contempt (e.g., others-oriented moral emotions) that they experienced.

The first group comprised 82 participants (88% were females). Their average age was 21.13 ($SD = 3.18$) years. The second group comprised 86 participants (85% were females) with an average age of 21.01 ($SD = 4.39$) All were psychology students and received credit points for participation.

Results
The results are presented in two parts. First, we show the differences among the average levels of the judgments of self-oriented moral emotions. Second, we describe the differences among the average levels of the judgments of others-oriented moral feelings.
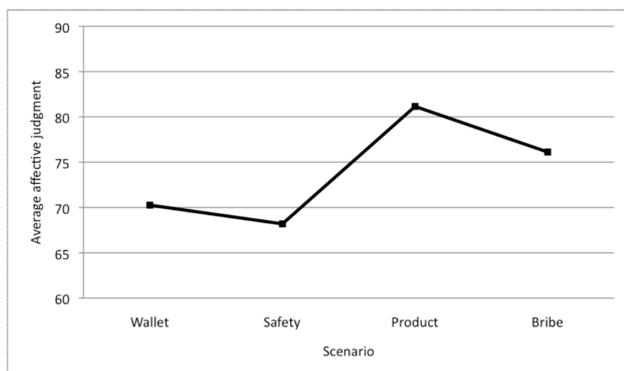
Figure 1. Average values of the judgments of self-oriented moral emotions for the four moral scenarios (scale from 0 to 100).
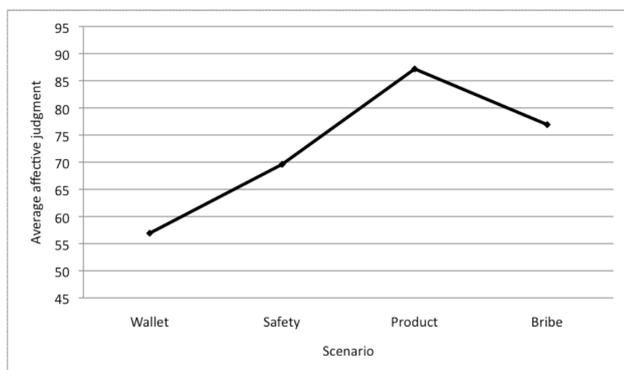

Figure 2. Average values of the judgments of others-oriented moral emotions for the four moral scenarios (scale from 0 to 100).

Self-oriented moral emotions

First we calculated Cronbach-alpha coefficients across the three self-oriented emotions: shame, guilt, and embarrassment. These turned out rather high: 0.88 for the wallet scenario, 0.84 for the safety scenario, 0.73 for the product scenario, and 0.77 for the bribe scenario. Therefore, in comparing the strength of the self-oriented emotions for the four moral scenarios, we used average values across the three affective evaluations. These are shown in Figure 1.

As can be seen in Figure 1, the four scenarios divided themselves into two pairs of scenarios: two scenarios with a weaker affective judgment (wallet, safety), and two scenarios with a stronger affective judgment (product, bribe). ANOVA for repeated measures revealed significant main effect of scenario [$F(3, 79) = 13.821$; $p < 0.001$; $\eta^2 = 0.34$]. Similarly, when we averaged affective judgments within the two pairs, the value was significantly lower for the wallet-safety pair ($M = 69.23$; SD = 20.44) than for the product-bribe pair ($M = 78.63$; SD = 14.15) [$t(81) = 5.005$; $p < 0.001$].

Others-oriented moral emotions

Similarly as in the case of the self-oriented emotions, the three others-oriented moral emotions (anger, disgust and contempt) turned out to be highly inter-related. The Cronbach-alpha coefficients for the four scenarios, measured across all affective judgments, had the following

values: 0.93 for the wallet scenario, 0.93 for the safety scenario, 0.84 for the product scenario, and 0.87 for the bribe scenario. The average judgments of others-oriented emotions are shown in Figure 2.

Similarly to the judgments of self-oriented emotions, Figure 2 shows that the four scenarios divided themselves into two pairs of scenarios: two scenarios with a weaker affective judgment (wallet, safety), and two scenarios with a stronger affective judgment (product, bribe). ANOVA for repeated measures revealed a significant main effect of the scenario [$F(3, 79) = 42.513$; $p < 0.001$; $\eta^2 = 0.61$]. In the analysis of others-oriented emotions we also counted the average affective judgments for the two pairs of scenarios: wallet and safety versus product and bribe. Again, the average affective judgment was lower for the former pair ($M = 63.26$; $SD = 21.78$), and higher for the latter pair ($M = 82.05$; $SD = 14.25$) [$t(81) = 8.94$; $p < 0.001$].

Thus, in the Preliminary Study we identified two groups of scenarios where violating the norm evoked weaker versus stronger negative moral emotions (both self-oriented and others-oriented).

Study 1: Moral emotions and moral judgments

The purpose of Study 1 was to find out whether the nature of moral judgment – utilitarian versus deontological – depends on the strength of moral emotions evoked by violating a moral norm involved in the situation. The nature of moral judgment – utilitarian versus deontological – was defined by the sensitivity of people's moral judgments to changes in the severity and probability of the deed's moral consequences. We hypothesized that when the violation of a moral norm evokes weaker moral emotions, the nature of moral judgments would be utilitarian, i.e., one would take into account moral consequences of the contemplated action (the severity and probability of these consequences). If, on the other hand, the violation of a moral norm evokes strong emotions, the nature of moral judgments would be deontological, i.e., they would not depend on the consequences of the considered action. In line with this argument, we formulated the following hypothesis:

Hypothesis one: *In scenarios where the moral norm violation evokes weaker moral emotions, moral judgments would be sensitive to changes in the (negative) values of moral consequences and their probabilities more than in scenarios where the violation of a moral norm evokes stronger moral emotions.*

Assuming that the consideration of consequences of an action takes time, we also formulated another hypothesis related to differences in reaction time.

Hypothesis two: *Judgment times would be longer in scenarios where the violation of a moral norm evokes weaker moral emotions than in scenarios where the moral norm violation evokes stronger moral emotions.*

Table 2

Descriptions of the low and high values of the two risk parameters (probability and severity of negative moral consequences) for the four moral scenarios used in Study 1.

Kind of scenario	Low probability [Low severity of consequences]	High probability [High severity of consequences]
Scenario A – Wallet	The money in the wallet was won in a lottery, so the probability of the wallet's owner getting into financial trouble is low (about 10%).[From a card in the wallet, person A knows that its owner is wealthy – he owns several local shops.]	The money in the wallet comes from a bank loan, so the probability of the wallet's owner getting into financial trouble is high (70 - 100%). [From papers in the wallet, A knows that its owner is very poor – he is a handicapped person on a disability pension.]
Scenario B – Safety	The probability of such an accident is estimated by factory engineers as low (no higher than 10%).[If B puts off introducing the technological changes, a potential accident may be somewhat harmful for the workers.]	The probability of such an accident is estimated by factory engineers as high (higher than 70%).[If B puts off introducing the technological changes, a potential accident may even be fatal.]
Scenario C – Product	Medical data shows that the probability of health problems is rather low (less than 10%).[Persons who consume the drink may suffer small health problems that will be easily and quickly treated.]	Medical data shows that the probability of health problems is rather high (more than 70%).[Persons who consume the drink may suffer severe chronic health problems that will be difficult to treat.]
Scenario D – Bribe	The place where person D stopped the tipsy driver is near the driver's home, so the probability of an accident is low (about 1:10).[The driver who has been stopped by person D rides a small motorcycle, so he will not cause a severe accident while riding home.]	The place where person D stopped the driver is far from the driver's home, so the probability of an accident is high (about 7:10).[The driver stopped by policeman D drives a big truck, so he could cause a severe accident.]

Method

Study 1 was designed as a 2 (type of a moral scenario; within subjects) by 2 (probability of negative moral consequences; between subjects) by 2 (severity of negative moral consequences; between subjects) experiment. In the analysis of results we examined how the two independent variables – the moral scenario and the probability and severity of moral consequences – influenced people's moral judgments.

The first independent variable in the experiment was the type of the moral scenario. We used the same four scenarios as in the Preliminary Study. However, the analysis compared people's judgments in two pairs of scenarios evoking strong versus weak moral emotions, and not judgments in all four specific scenarios. The two next independent variables were probability and severity of negative moral consequences. Probabilities were presented using both verbal ("low" vs. "high") and numerical (e.g., 10%-increment) descriptions. The severity of moral consequences was presented using only verbal descriptions. Table 2 shows how the low and high values of the two risk parameters were verbalized in the four scenarios.

Participants were shown the four experimental scenarios one by one in a random order. After reading the scenario, the participant was asked to imagine that the person in the story had broken the moral norm (e.g., had decided to keep the wallet found on the street) and to indicate how severely the participant blamed the behavior, on a 7-point scale from 1– "very low blame," to 7 – "very high blame." Thus, in the case of scenario A, participants indicated how severely they blamed the keeping of the wallet. The scale was placed below the scenario.
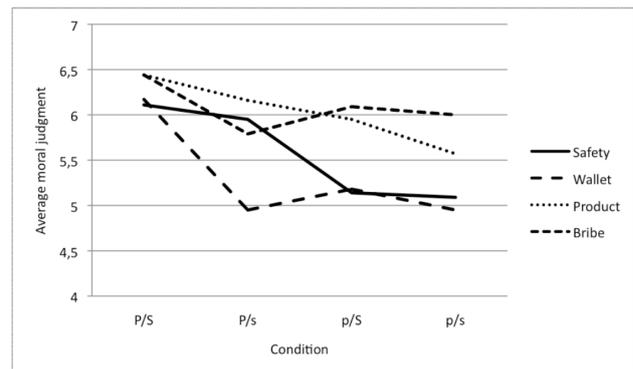

Figure 3. Sensitivity of moral judgments, in the four scenarios, to different values of probability and severity of adverse moral consequences (p/s – low probability, low severity; P/S – high probability, high severity).

The second dependent variable measured in Study 1 was the reaction time (time needed to make the judgment). To avoid differences in time required for reading, all four scenarios were of the same length in terms of number of characters, including spaces.

The experiment was run using MediaLab software, and participants completed the task individually. Altogether 80 subjects (81% were females) participated in the study. Their average age was 22.95 years (SD = 9.26). All were psychology students and received credit points for participation.

Results

Sensitivity of moral judgments to changes in the value of risk parameters (outcomes and probabilities)

Figure 3 shows the sensitivity of people's moral judgments to the changes in the two risk parameters (probability and severity of adverse moral consequences).
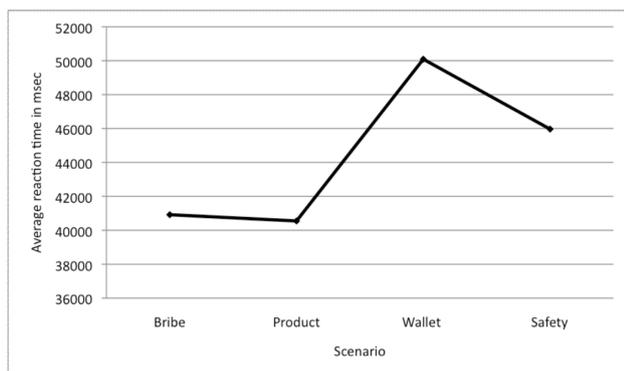
Figure 4. Time used to make the moral judgments in the four moral scenarios (measured in milliseconds).

The graphs in Figure 3 suggest that in their condemnation of the immoral behavior, people were more sensitive to changes in values and in probabilities of moral consequences in the case of the wallet scenario and the safety scenario than in the case of the bribe and product scenarios.

To test hypothesis one, we calculated average moral judgments for two pairs of scenarios: two scenarios (bribe and product) where violating moral norm evoked stronger moral emotions, and two scenarios (wallet and safety) where violating the moral norm evoked weaker moral emotions in the Preliminary Study. A three-way analysis of variance: scenario (2 levels, within-subjects) by probability (2 levels, between subjects) by value (2 levels, between-subjects) revealed main effects for both probability and severity of moral consequences [$F(1, 76) = 10.756$; $p < 0.002$; $\eta^2 = 0.12$, for probability; $F(1, 76) = 6.251$; $p < 0.02$; $\eta^2 = 0.08$, for severity]. On the average, moral judgments were more severe when the probability of negative consequences was higher ($M = 6.01$; $SD = 0.53$) than when this probability was lower ($M = 5.50$; $SD = 0.83$). Similarly, more severe moral judgments we associated with a higher value of negative consequences ($M = 5.94$; $SD = 0.68$) than with a lower value of these consequences ($M = 5.55$; $SD = 0.77$).

The analysis also showed a marginally significant probability by scenario interaction effect [$F(1, 76) = 3.513$; $p < 0.065$; $\eta^2 = 0.04$]. In the case of scenarios evoking weak moral emotions higher probability of negative consequences was associated with more severe judgments ($M = 5.78$; $SD = 0.63$) than lower probability ($M = 5.09$; $SD = 1.08$) [$t(78) = 3.42$; $p < 0.001$]. Such difference was not observed in the case of scenarios evoking strong moral emotions [$t(78) = 1.67$; $p > 0.10$]. These effect demonstrates that people were more sensitive to changes in the probability parameter when making judgments for scenarios where violating moral norms evoked weaker moral emotions than for scenarios where violating moral norms evoked stronger moral emotions, what is consistent with our hypothesis. On the other hand, no significant interaction between the severity

of moral consequences and scenario was found [$F(1, 76) = 0.079$; $p > 0.77$], which stands in contradiction to our hypothesis.

Time needed to make the moral judgment (reaction time)

Figure 4 shows differences among the four moral scenarios in the time used by the participants to make their moral judgments. The vertical line shows results measured in milliseconds.

As presented in Figure 4, the four scenarios differed in the time the participants needed to arrive at the moral judgment [$F(3, 237) = 12.935$; $p < 0.001$; $\eta^2 = 0.34$]. In accordance with hypothesis two, the four scenarios formed two pairs. The average reaction time was faster in the case of the two scenarios (bribe and product) where moral norm evoked stronger moral emotions ($M = 40,735.79$; $SD = 9,834.72$), and slower in the cases of the second pair of scenarios (wallet and safety) where the moral norm violation evoked weaker moral emotions ($M = 48,027.98$; $SD = 14,309.48$).

Discussion

Results presented so far seem to draw a quite consistent picture of how our participants made their moral judgments. However, it should be noted that not all results were congruent with our hypotheses (no significant interaction between the type of scenario and the severity of negative moral consequences was found). In two situations (selling an unsafe product and accepting a bribe) in which moral norms evoked stronger moral emotions, moral judgments were insensitive to changes in the two risk parameters (severity of moral consequences and their probability). At the same time, people made these judgments quite fast. On the other hand, in two other situations (keeping a wallet found on the street, and not introducing safety technology in a factory), in which moral norms evoked weaker moral emotions, moral judgments were more sensitive to changes in at least one risk parameter (probability). Interestingly, no differences between the two pairs of scenarios were found concerning changes in the severity of negative moral consequences. One should notice here that our manipulations of low versus high severity of consequences were lacking the test of whether the subjects perceived them as different in severity. On the other hand, manipulations of low versus high probability were perfectly comparable across scenarios. Finally, in the two latter scenarios the time used to make moral judgments was longer than in the two former scenarios.

Generally, the picture presented so far suggests that in the first pair of scenarios (unsafe product and bribe) people were making moral judgments as if they were

Table 3
Descriptions of the low and high values of the two risk parameters (probability and magnitude of adverse material outcomes) for the four moral scenarios used in Study 2.

Kind of scenario	Low probability [Low adverse material outcomes]	High probability [High adverse material outcomes]
Scenario A – Wallet	The probability that Person A will be penalized is low (no more than 10%) because no one saw him take the wallet. [A's punishment would be low. The law does not treat such offences as severely as in the past (a typical fine is 300 zlotys).]	The probability that Person A will be penalized is high (over 50%) because several people saw him take the wallet. [A's punishment would be high. The law treats such offences more severely than in the past (a typical fine is over 3,000 zlotys).]
Scenario B – Safety	The probability that Person B's negligence will be found out is low (no more than 5%). Experience shows that inspections are typically not repeated. [If inspectors find out about B's negligence, he will have to pay a low fine (a few hundred zlotys). He can pay it easily.]	The probability that Person B's negligence will be found out is high (over 70%). Experience shows that inspections are typically repeated.[If inspectors find out about B's negligence, he will have to pay a high fine (several thousand zlotys). He may also go to prison.]
Scenario C – Product	The probability that Person C will have to pay a fine is low (no more than 10%) because the contamination can be attributed to external factors. [If the contamination is discovered, the fine paid by C will be low (several hundred zlotys) – the consequences of the contamination are not great.]	The probability that Person C will have to pay a fine is high (over 70%). The contamination cannot be attributed to external factors but only to C's negligence. [If the contamination is discovered, the fine paid by C will be high (several thousand zlotys) – the consequences of the contamination are substantial.]
Scenario D – Bribe	The probability that Person D will be punished is low (5%, at most). The detection rate for such crimes is low.[If the incident is detected, D will receive only a small punishment – he will eventually be moved to a worse workplace.]	The probability that Person D will be punished is high (up to 50%). The detection rate for such crimes has recently increased.[If the incident is detected, D will receive severe punishment – he may even be fired.]

deontologists: they tended to ignore values and probabilities of the consequences of the act (and that shortened the time of making judgments). On the other hand, in the second pair of scenarios (wallet, safety), people were making utilitarian judgments which tended to depend at least on the probability of negative moral consequences (and that lengthened the time of making judgments).

Study 2: Moral emotions and moral choices

The purpose of Study 2 was to examine how people resolve conflicts between moral sentiments and economic self-interest. Similarly as in the case of moral judgments, we assumed that the crucial factor determining decision strategy in choices between alternatives with moral consequences is the strength of negative emotions evoked by violating the moral norm involved in the situation. In this experiment we focused on the role of the strength of negative emotions in decision maker's willingness to take a risk. Therefore, we used scenarios involving risky options. These options contained information about possible financial outcome of the action and about probability associated with this outcome. For example, in the scenario about selling an unsafe product participants were given information about the potential fine, if the producer is caught, and about the probability that the producer can be caught. Composing this kind of options, we used once again the same four scenarios as in the Preliminary Study. Thus, in these scenarios, apart of the two risk parameters (outcome and probability) the option involved violation of a moral norm. In Study 2

we also decided to use some 'purely' economic choices. In line with the conclusion drawn in the Introduction, we formulated three hypotheses that are presented below.

Hypothesis one: In general, people should be more sensitive to changes in the values of outcomes and probabilities when making 'purely' economic choices that are free of moral considerations, than when making choices that are associated with some moral concerns.

Hypothesis two: People's choices should be more sensitive to changes in the values of outcomes and probabilities in scenarios where violating a moral norm evokes weaker moral emotions than in scenarios where violating a moral norm evokes stronger moral emotions.

Hypothesis three: Decision times would be longer in scenarios for which violating moral norm evokes weaker moral emotions than in scenarios for which moral norm evokes stronger moral emotions.

Method

In this study eight scenarios were used. Four scenarios were associated with violating a moral norm, while the other four scenarios comprised four economic problems that were free of any moral considerations. In the remaining part of the paper, these latter four scenarios will be called 'purely economic problems'. The reason for using the two sets of problems was to compare sensitivity to quantitative risk parameters between situations - respectively - involving and not involving moral aspects. The four purely economic problems are presented below.

Scenario X – Business:

Table 4
Descriptions of the low and high values of the two risk parameters (probability and magnitude of adverse material outcomes) for the four purely economic scenarios used in Study 2.

Kind of scenario	Low probability [Low adverse material outcomes]	High probability [High adverse material outcomes]
Scenario X – Business	Person X has asked an expert to rate the probability of failure. The expert claims that this probability is low (10%, at most).[To start the business, X must take out a small bank loan (about 10,000 zlotys). In the event of failure, his losses will be low.]	Person X has asked an expert to rate the probability of failure. The expert claims that this probability is high (over 70%).[To start the business, X must take out a substantial bank loan (about 100,000 zlotys). In the event of failure, his losses will be high.]
Scenario Y – Stocks	Person Y has analyzed the forecasts of several financial analysts. They estimate the probability of further price drops as low (no more than 10%).[Y has invested only a small part of his savings in these stocks, so even in the event of further price drops his losses will be small.]	Person Y has analyzed the forecasts of several financial analysts. They estimate the probability of further price drops as high (over 70%).[Y has invested almost all his savings in these stocks, so in the event of further price drops his losses will be severe.]
Scenario Z – Insurance	The probability that the car will be stolen is low (no more than 1:100). The car has several protections and is kept in the garage.[The car was bought for a small price (5,000 zlotys), so even in the event of theft Person Z's loss will be low.]	The probability that the car will be stolen is high (higher than 1:20). The car does not have protections and is parked on the street.[The car was bought for a substantial price (over 50,000 zlotys), so in the event of theft Z's loss will be high.]
Scenario K – Purchase	Data in professional journals show that this equipment is reliable, so the probability of its failure is low (5%, at most).[Spare parts for this equipment are cheap, so even in the event of a failure Person K's losses will be low.]	Data in professional journals show that this equipment is unreliable, so the probability of its failure is high (over 50%).[Spare parts for this equipment are expensive, so in the event of a failure Person K's losses will be high.]

Person X has recently graduated from a business school and wants to open his own firm. He wants to be successful quickly and has decided to enter a niche market. This means that he needs a lot of money and must take out a bank loan. X is aware that in the event of failure he will have serious financial problems.

Scenario Y – Stocks:

Person Y recently purchased stocks. Their prices went up, but are now substantially falling. Y considers what to do. He can wait till the price drop reverts, but in doing so he risks further price decreases.

Scenario Z – Insurance:

Person Z recently bought a car in a foreign country. He spent a lot of money on various formalities, and wonders whether to insure the new car against theft.

Scenario K – Purchase:

Person K has decided to buy home-cinema equipment. To pay less, he is considering buying it from someone who imports such equipment from abroad. Because it is not purchased in the country where K lives, it has no warranty. In the event of a breakdown, he will have to pay for new parts.

Study 2 was designed as an 3 (type of a scenario; within subjects) x 2 (probability; between subjects) x 2 (severity of negative financial consequences; between subjects) experiment. We examined how independent variables – the type of a scenario (purely economic scenarios vs. moral scenarios associated with a weak moral norm vs. moral scenarios associated with a strong moral norm), and the probability and severity of negative financial consequences – influenced people's moral choices.

As in Study 1, probabilities were presented using both verbal ("low" vs. "high") and numerical (e.g., 10%-increment) descriptions. Magnitudes of adverse financial outcomes were presented only with the use of verbal descriptions. Table 3 shows how the low and high values of the two risk parameters were verbalized in the four moral scenarios, and Table 4 shows these parameters for the four purely economic problems.

The participants were assigned randomly to one of the four experimental conditions. Each condition corresponded to one of the four possible combinations of low/high value of the probability and magnitude of adverse monetary outcomes (see Tables 3 and 4). After reading the scenario description, the participants were asked to imagine that they had been the characters/people described and to indicate how willing they would be, on a 7-point scale, to engage in the situation (i.e., to take the risk associated with the choice). For example, in the case of Scenario X the following instruction applied: "If you were Person X, how willing would you be to take out the bank loan in order to open your firm? (click on one point on the scale)" The scale was placed below the scenario description. All scenarios (moral and purely economic) were presented to the participants in random order. Every participant responded to all eight scenarios.

As in Study 1, we also measured reaction time, i.e., the time needed to make the choice. To avoid differences in the time required for reading, all eight scenarios were of the same length (the same number of characters, including spaces).
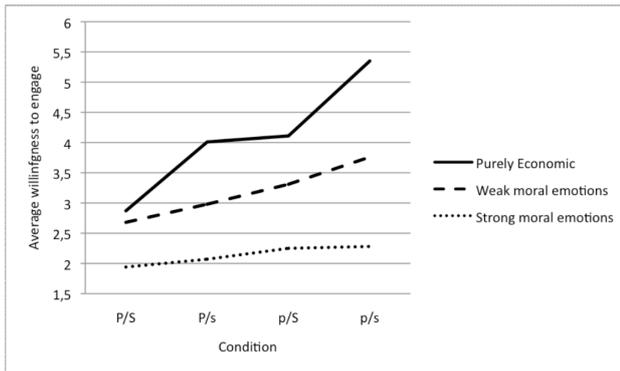
Figure 5. Sensitivity of willingness to engage (i.e., to make a risky choice) in the three groups of scenarios to various probabilities and magnitudes of adverse monetary outcomes (p/s – low probability/low loss; P/S – high probability/high loss). Scale from 1 to 7.
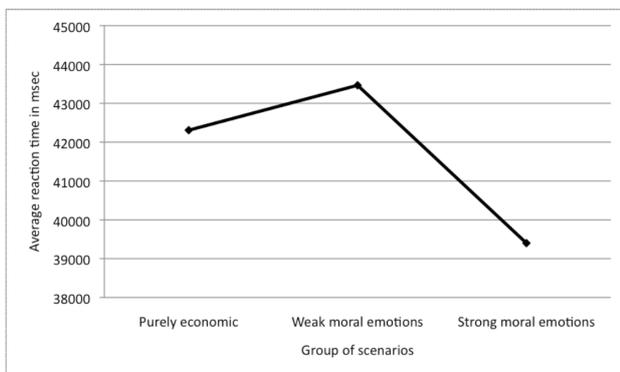

Figure 6. Time (in milliseconds) used to make the choice in the three categories of scenarios: (1) scenarios associated with moral norms evoking stronger negative emotions, (2) scenarios associated with moral norms evoking weaker negative emotions, (3) purely economic scenarios.

The experiment was run using MediaLab software, and participants completed the task individually. Altogether 104 people (80% were females) participated in this study. Their average age was 26.68 years ($SD = 12.21$). All were psychology students and received credit points for participation.

Results

The results are presented in two parts. First, we show when people's choices were sensitive to changes in the two risk parameters (the probability and magnitude of adverse monetary outcomes). Second, we present the differences in reaction time (i.e., the time needed to make the choice). In both parts, the examination of results focuses on comparison among the three categories of scenarios: purely economic situations and the two pairs of moral scenarios.

Moral choice in relation to changes in the probability and magnitude of adverse monetary outcomes

Figure 5 shows how people's willingness to engage in an activity changed with the value of probability and magnitude of adverse monetary outcomes. Average results are presented for three categories of scenarios: (1) purely economic scenarios (business, stocks, insurance, and

purchase), (2) scenarios where violating moral norm evokes weaker negative emotions (wallet, safety), and (3) scenarios where violating moral norm evokes stronger moral emotions (bribe, product).

To test hypotheses one and two, we carried out a three-way analysis of variance: scenario (3 levels; within subjects) by probability (2 levels; between subjects) by value (2 levels; between subjects) to test how changes in the two basic risk parameters influenced people's choices in the three groups of scenarios.

We found significant main effects for probability [$F(1, 100) = 27.428$; $p < 0.001$; $\eta^2 = 0.22$], and for outcomes [$F(1, 100) = 14.523$; $p < 0.001$; $\eta^2 = 0.13$]. On the average, people were more willing to make risk-accepting choices when the probability of negative outcomes was low ($M = 3.84$; $SD = 0.77$) than when this probability was high ($M = 2.95$; $SD = 0.72$). Similarly, average willingness to take risk was higher when the value of negative consequences was low ($M = 3.72$; $SD = 0.79$) than when it was high ($M = 3.01$; $SD = 0.80$).

Apart from the main effects, the two interaction effects have been found. First, the probability by scenario effect [$F(2, 200) = 8.764$, $p < 0.001$; $\eta^2 = 0.08$] showing that people were most sensitive to changes in the probability parameter when making judgments for purely economic scenarios. This sensitivity dropped for moral scenarios associated with moral norms that evoked weaker negative emotions, and was lowest for moral scenarios associated with moral norms that evoked stronger negative emotions. Second, the value by scenario effect [$F(2, 200) = 10.708$, $p < 0.001$; $\eta^2 = 0.10$] showing that people were most sensitive to changes in the value parameter when making choices for purely economic scenarios. This sensitivity dropped for moral scenarios associated with moral norms that evoked weaker negative emotions, and was lowest for moral scenarios associated with moral norms that evoked stronger negative emotions

To examine more precisely the nature of the interaction described above, we also tested differences in sensitivity to changes in the value of risk parameters for two pairs of scenarios: purely economic scenarios versus moral scenarios associated with weaker emotions, and moral scenarios associated with weaker emotions versus moral scenarios associated with stronger emotions.

In the first comparison, two interaction effects were found: probability by scenario interaction [$F(1, 100) = 4.70$; $p < 0.05$; $\eta^2 = 0.04$] and value by scenario interaction [$F(1, 100) = 8.96$; $p < 0.01$; $\eta^2 = 0.08$]. Both interactions indicated that participants were much more sensitive to changes in the risk parameters when making choices in purely economic situations.

For the second comparison no statistically significant value by scenario interaction effect was found ($p > 0.20$), and the probability by scenario interaction was observed

on the trend level [$F(1, 100) = 3.69$; $p > 0.05$]. People were more sensitive to changes in probability when making choices in situations associated with weaker emotions.

Time needed to make the moral choice (reaction time)

Figure 6 shows the average choice-making times for the three categories of scenarios: (1) scenarios associated with moral norms evoking stronger negative emotions (bribe, product), (2) scenarios associated with moral norms evoking weaker negative emotions (wallet, safety), and (3) purely economic scenarios (business, stocks, insurance, and purchase).

On the average, participants made the fastest choices in the two scenarios that were associated with moral norms evoking stronger negative emotions (M = 39,400.04; SD = 8,254.91), and the slowest choices in the scenarios associated with moral norms evoking weaker negative emotions (M = 43,464.30; SD = 10,480.56) [$F(2, 206)$ = 13.366; $p < 0.001$; $\eta^2 = 0.11$]. However, the difference in reaction time between the scenarios associated with moral norms evoking weaker negative emotions and purely economic scenarios (M = 42,308.66; SD = 9,311.77) was not significant [$t(103) = 1.59$; $p > 0.11$].

Finally, we calculated correlations between reaction times and choice preferences (measured on a 7-point scale). This analysis revealed no statistically significant correlation between the two variables for the two scenarios, in which violating a moral norm evoked weak emotions ($p > 0.07$ for the safety scenario, and $p > 0.14$ for the wallet scenario). However, we found a positive and statistically significant correlation for two other scenarios, in which violating a moral norm evoked strong emotions ($r = 0.29$; $p < 0.01$, for the bribe scenario, and $r = 0.25$; $p < 0.01$, for the product scenario). The more participants were prone to violate a moral norm in the two latter scenarios, the more time they needed to make the choice.

Discussion

The experiment that was carried out in Study 2 confirmed all three hypotheses. First, people were more sensitive to changes in the values of outcomes and probabilities, and their response times were longer, when making purely economic choices than when making decisions associated with strong moral concerns. This suggests that while in purely economic choices people could use the compensatory decision strategy, when making trade-offs between moral aspects and material payoffs, people could base their choices on moral norms rather than on trade-offs, at least in some moral situations.

Moreover, people were more sensitive to changes in the values of outcomes and probabilities in those scenarios where violating moral norms evoked weaker negative emotions, than in scenarios where violating moral norms evoked more intense negative emotions. In fact, the

decision-making process in the moral situations in which the moral norm does not evoke strong negative emotions, resembles the process of making purely economic choices. This suggests that in the former scenarios compensatory decision rules may be applied, while in the later scenarios decisions may entirely depend on the moral norm that is involved in the problem. Naturally, this is only a presumption. Insensitivity to risk parameters in scenarios where violating moral norms evoked intense negative emotions might be due to a high value of the *a* parameter in the trade-off expression: *(1-a) u$_s$ (x) + a u$_m$ (x)*. In other words, it might be due to a high weight ascribed to a moral value. Still, two further results from our study seem to support our claim. The first is the difference in reaction time between the scenarios associated with moral norms evoking weaker versus stronger negative emotions. The second is a positive correlation between reaction times and choice preferences for those scenarios, in which violating a moral norm evoked strong emotions, but lack of such correlation for scenarios, in which violating a moral norm evoked weaker emotions. Thus, in the scenarios, in which violating a moral norm evoked weaker emotions, subjects needed more time to make a decision and this reaction time was independent on the choice they made. This fits well the trade-off process. On the other hand, in the scenarios, in which violating a moral norm evoked strong emotions, subjects needed less time to make a decision and the more the subjects were prone to violate a moral norm, the more time they needed to make a choice. Presumably, subjects tended to make a choice without the trade-off process, and those who decided against the moral norm (which evoked strong emotions), had to overcome their intuition first and this took more time.

Unfortunately, similarly to Study 1 where we manipulated the value of moral consequences, our Study 2 also lacks the manipulation test to find out whether the difference between more severe and less severe consequences was perceived in the same way for all scenarios. Therefore, the possibility exists that differences concerning the severity of consequences (but not the value of probabilities) could pose alternative explanations for patterns of results that we attributed to the strength of emotions evoked by violating a moral norm. Still, the general pattern of results we obtained strongly suggests the interpretation in terms of applying compensatory versus non-compensatory decision rule. This explanation will be further explored in the General Discussion section.

General Discussion

The two experiments presented in this paper concern the role of emotions in moral judgments and in making economic decisions associated with moral issues.

We showed that in both cases the strength of emotions evoked by violating the moral norm plays a very important role. In the case of moral judgments, it has been demonstrated that the strength of emotions may influence the sensitivity of moral judgments to changes in probabilities of negative moral consequences. The influence of emotions on the sensitivity of judgments to changes in probability has already been demonstrated in the case of personal consequences. Indeed, Rottenstreich and Hsee (2001) showed that affect-rich outcomes (those evoking strong emotional reactions), as opposed to affect-poor ones, resulted in lower sensitivity to intermediate probability variations. We found the same effect in the context of moral judgments.

This result may be of certain value for the debate on the nature of moral judgments. In this debate, utilitarians hold that what is morally right or wrong depends on the consequences of an act. Thus, in accordance with this view, moral judgments should be sensitive to the severity of a harm brought to others by the act. However, in accordance with the modern utility theory, this claim can be supplemented by the statement that moral judgments should be also sensitive to the probability of the harm brought to others. Our research showed that people are generally quite sensitive to both severity and probability of the harm brought to others. Moreover, this is only true when an act does not elicit strong negative emotions, i.e. when subjects behave as utilitarians.

An intriguing question for a cross-cultural research would be whether cultures differ only in the strength of emotional reactions to violating various moral norms or whether, additionally, they differ in the acceptance of trade-offs between material and moral values. For example, during our personal communication with David Ong from Peking University HSBC Business of School, he suggested that in Chinese culture there is less taboo trade-offs than in Western culture.

In Study 2, testing the role of emotions in making decisions associated with moral questions, we found that the strength of affect can influence the decision strategy applied in these situations. Stronger moral emotions evoked by a violation of the moral norm made people less sensitive to changes in the values of outcomes and probabilities of material consequences than weaker moral emotions. The sensitivity to outcomes and the probability of consequences implies that decision makers apply a compensatory decision rule, while insensitivity to these parameters indicates applying a non-compensatory decision rule.

These results are in line with the priority heuristic model, which was the basis for our research. When decision makers face a decision that entails moral consequences, they first examine moral consequences of the considered action. When the moral sentiment associated with the violation of a moral norm is not strong enough, the decision maker follows the compensatory decision rule considering trade-offs between moral and material consequences of the alternative. This can lead to either rejection or acceptance of the action that violates the moral norm.

On the other hand, when the sentiment associated with violating moral norms involved in the action is strong enough, no trade-offs between moral and material consequences are made. One can hardly imagine that the decision-makers could base their choice on a compensatory trade-off between material and moral values. Instead they would try to follow the lexicographic rule with the primacy of moral values. After all, the majority within a society of people do not commit serious crimes, and that is not because they carefully consider trade-offs between material and moral values. They rather give priority to the moral norm over material values. They reject or never even consider a great deal of activities that would bring considerable profits but, at the same time, would violate some moral norms associated with strong moral sentiments. Of course, it does not mean that moral norms always prevail over material goods. It is well known that there are cases of violating moral norms even if such behavior evokes strong negative emotions. What seems to be crucial in this case, is the strength of the temptation. When material consequences do produce strong temptation, the decision maker tries to edit the decision situation in such a way that the choice of the option associated with material profits will not be perceived in terms of a violation of moral norms. In accord with Montgomery (1983; 1989), we propose to refer to this process as the dominance structuring. This is the decision maker's attempt to find such a cognitive structure in which the to-be-chosen alternative dominates other alternatives. This can be done through the neutralization of the disadvantages of the to-be-chosen alternative. Perhaps, the simplest way to achieve this goal is such a categorization of the deed that the category label does not evoke strong negative emotions any more. A perfect literary illustration of such a process may be found in Fyodor Dostoyevsky's novel, *Crime and Punishment*. Rodion Raskolnikov explains to his sister Dounia that his decision to kill the old woman had been useful to himself and to society: *I killed a vile noxious insect, an old pawnbroker woman, of use to no one!... Killing her was atonement for forty sins. She was sucking the life out of poor people. Was that a crime? I am not thinking of it and I am not thinking of expiating it* (…).

When the decision maker succeeds with such dominance structuring, the dominance rule determines the choice. Thus, we assert that no matter which of the two values – moral norms or self-interest – takes priority, under strong emotions associated with the violation of a moral norm no trade-off takes place. Naturally, this hypothesis requires further testing. The psychological process model from which our predictions were derived should be tested using process tracing techniques (first of all, information search and

thinking aloud techniques). Only this kind of investigation will allow us to test directly whether a decision-maker is considering a violation of the moral norm involved in an economic decision, and how they combine moral aspects of the decision process with their self-interest.

Acknowledgments

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