

Gains versus losses in a simple sender receiver game: Experimental evidence on framing

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Abstract: Gneezy (2005) demonstrated that human beings lie more often when the return is higher. Prospect theory and loss aversion suggest that people react more to losses than to gains of the same magnitude. We test the resulting prediction that human beings are more likely to lie when facing a potential loss than a potential gain, controlling for a variety of socio-economic factors. We find people are more likely to lie when facing a loss. In addition a number of other factors were found to influence the decision to lie. For example; students who are declared business majors engaged lied more often than others, while the reported sex of the individual had no impact.

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1. Introduction

Any situation involving asymmetric information provides an opportunity to engage in deception. In many of these situations lying can lead to greater payoffs than honesty. Lying, however, involves costs of its own. Therefore, a meaningful decision must be made each time an opportunity to lie presents itself. A growing body of literature explores this decision using the methods of experimental economics (Corson et al. 2003, Gneezy, 2005, Sanchez-Pages and Vorstaz 2007, Dreber and Johannesson 2008, Mazar, et al. 2008, Erat and Gneezy 2009, Sutter 2009, Aoki, Akai, & Onoshiro 2010, Childs 2011).

Experimental economic work on deception has profound implications for our understanding of deception. We can expect to be lied to more often when the stakes are higher (Gneezy 2005). We can expect men to lie for a personal gain more often than women (Dreber and Johannesson 2008, Erat and Gneezy 2009), while women are more likely to lie for the benefit of another (Erat and Gneezy 2009). We can even expect to be told the truth in some attempts to manipulate us (Sutter 2009).

One of the consistent results of this research is that the setting and nature of incentives in a situation influence the likelihood of deception. One aspect of setting and incentives which has not yet been explored is that lying may be more likely to avoid a loss than in pursuit of a gain.

The fact that humans are more sensitive to losses than gains has a long history in experimental economics and psychology. Tversky and Kahneman (1981, 1992) include

this fact in prospect theory. Loss aversion, coupled with frequent evaluation, has been used to explain the equity premium puzzle (Benartzi and Thaler 1995, Thaler, Tversky, Kahneman, and Schwartz 1997). Booij and Kuilen (2009) have even managed to estimate a value function for an entire population which exhibits the predicted higher sensitivity to losses.

Combining the notion of costly lying and an asymmetric value function leads to an interesting research question: Are people more likely to lie to avoid a loss than to secure a gain of the same magnitude? This is the question we explore in this paper. The application of expected utility theory leads to a prediction of no meaningful difference between gains and losses. An asymmetric value function, as in prospect theory, predicts lying will be more common when subjects are motivated by a potential loss. When two competing theories generate different predictions it is natural to turn to experimentation. The remainder of the paper is organized as follows. Section 2 provides a brief review of expected utility theory and asymmetric value functions as they are relevant to this game. We present the experimental environment in Section 3 and the experimental results in Section 4. In Section 5 we present our conclusions and some discussion.

2. Brief Review of the Theories and Lying

2.1 Expected Utility Theory

Expected utility theory has been the dominant theory in microeconomics for a remarkable length of time. In this theory, the level of utility associated with an outcome is a function of the final amount of a good or goods that describe the outcome. Experimental economics generally uses monetary payments to induce preferences over outcomes. The

general presumption is the resulting preferences can be represented as a relationship like the one shown in Figure 1.

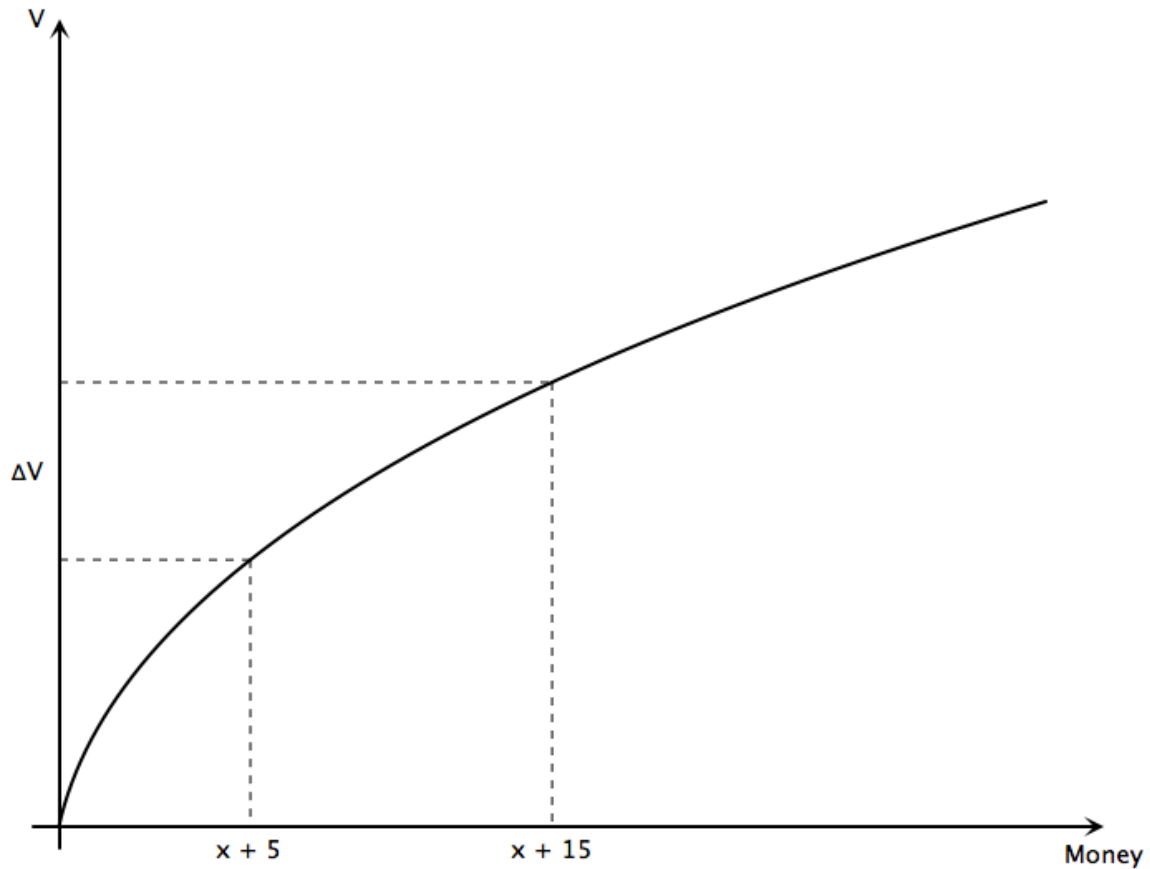


Figure 1: Expected Utility Theory Value Function

Any difference in the value of the two outcomes is based only on the difference in amount of money to be received. In Figure 1, the value x , represents the wealth of the individual outside the experiment. In this example, the one outcome yields a payoff of \$5 and the other, \$15. The difference to the individual is ΔV .

This approach predicts no substantive difference in treatment of gains or losses. The inputs into the theory are the final outcomes (how much money the person has at the end). Thus a change in the framing of incentives as gains or losses will have no impact on the choices made by subjects.

2.2 Asymmetric Value Function

The value function used in prospect theory, myopic loss aversion, and other theories is asymmetric and has the shape shown in Figure 2. This type of value function appears to be real, as it has been estimated for an entire population by Booij & Kuilen (2009). As you can see, the difference to the individual of a gain of \$5 or \$15, ΔV_G , is much smaller than the difference of a loss of the same magnitude, ΔV_L . It is this value function that underlies the hypothesis lying is more likely in an effort to avoid a loss than in pursuit of a gain.

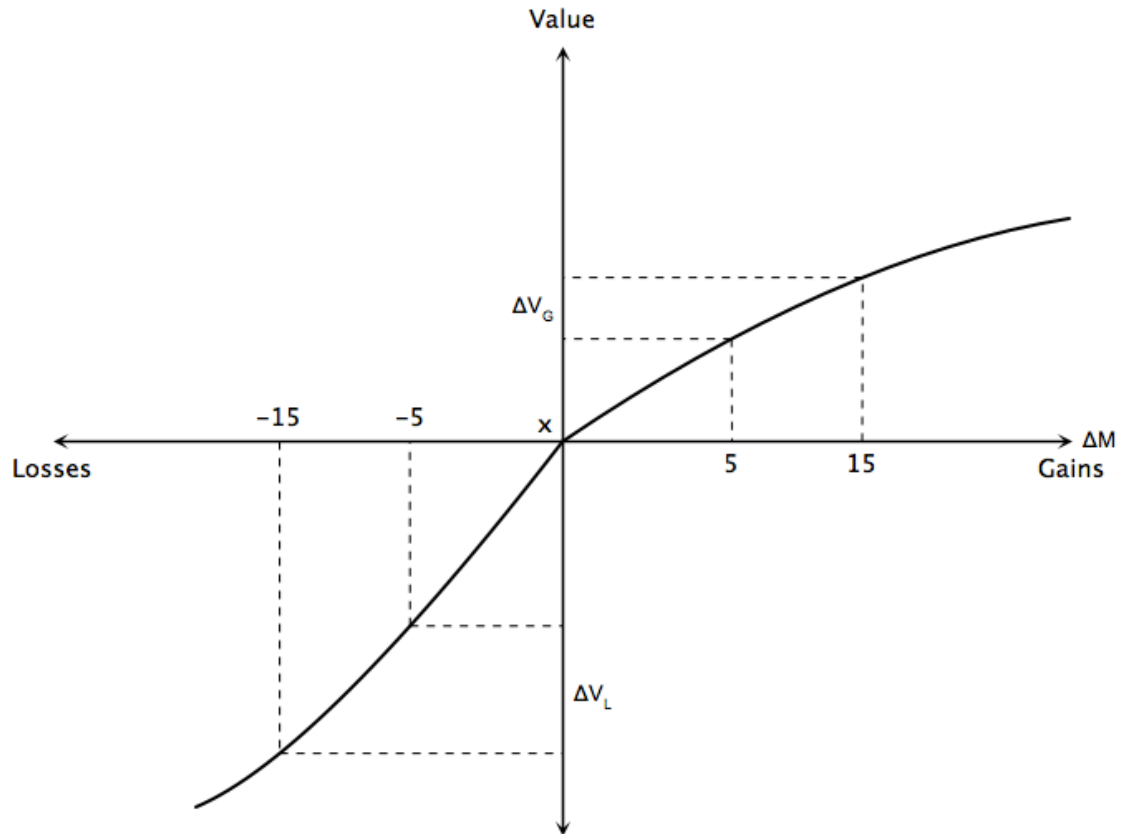


Figure 2: Asymmetric Value Function

In order for this value function to predict the actions of subjects, the subjects must update their reference point during the experiment. If subjects update their reference points (labelled x in Figure 2) after receiving an initial endowment, a loss will be a more powerful stimulus than a gain of the same magnitude.

2.3 Lying in the Literature

There are a number of factors beyond the nature of incentives that may have an impact on an individual's decision to lie. Dreber and Johannesson (2008) and Erat and Gneezy (2009) both find that males are more likely to lie for a monetary gain than females in this

type of environment. Others (Bernardi et al. 2004, Smyth and Davis 2004) using surveys of actions and attitudes toward dishonest behaviour have found that a student's faculty of study can be a good predictor of their propensity to lie. The psychology literature suggests a number of personal characteristics that may be linked to a person's propensity to engage in dishonest behaviour. A person's socio-economic status, the status of their parents marriage, and intelligence have all been linked to dishonest behaviour (Achenbach and Edelbrock 1981, Stouthamer-Loeber 1986, DePaulo and Jordan 1982, Turkat 1994).

3. Experimental Environment

3.1 Basic Sender-receiver game (The Gains Treatments)

The basic environment is based on Gneezy (2005). Individuals in separate rooms are paired with an unknown partner. Subjects in one room are assigned the role of sender and those in the other room the role of receiver. The sender is shown two different payoffs, one labelled A and the other B. In each case, one payoff offers more money to the sender and the other more money to the receiver. In Gneezy's (2005) experiment, the payoffs were structured to mirror a dictator or ultimatum game. For example, payoff option A might be \$15 for the sender and \$5 for the receiver, while option B would be \$5 for the sender and \$15 for the receiver¹. The payoffs are two possible divisions of \$20.

This is referred to hereafter as Treatment 1.

¹ In all treatments the order of payoffs was reversed for half the subjects. For half the subjects had payoffs in which A was \$15 for the sender, \$5 for the receiver and B was \$5 for the sender, \$15 for the receiver. The remaining subjects had payoffs in which A was \$5 for the sender, \$15 for the receiver and B was \$15 for the sender and \$5 for the receiver.

After seeing the payoff options, the sender chooses one of two possible messages to send to the receiver; either “Option A will earn you more than option B” or “Option B will earn you more than option A”. The senders are informed that the receivers will have no information other than what is contained in the message. In this simple environment, we define a lie as a message that the sender knows to be incorrect. This definition comes reasonably close to legal definitions of fraud. Thus, sending the message “Option A will earn you more than option B” when the payoffs were actually A(\$15,\$5) and B(\$5,\$15) is classified as a lie.

The second gains treatment uses the same environment but much smaller payoffs. In this case option A was \$7 for the sender and \$5 for the receiver, while B saw the sender get \$5 and the receiver \$7. In this case the payoffs are two possible divisions of \$12, this is referred to as Treatment 3.

3.2 Sender-Receiver Game with Losses (The Losses Treatments)

The main treatment was a change in the framing of incentives to subjects. Subjects in the treatment groups were initially endowed with a voucher for \$20, ostensibly for participating in the experiment. The incentives of the environment were then presented as losses. For example, option A was a *loss* of \$5 for the sender and a gain of \$5 for the receiver and option B was a *loss* of \$15 for the sender and a gain of \$15 for the receiver. The payoffs are, once again two possible divisions of \$20. This is Treatment 2.

In the second losses treatment, subjects were initially endowed with a voucher for \$12.

In this treatment option A was a \$5 *loss* to the sender and a \$5 gain to the receiver.

Option B was a \$7 *loss* to the sender and a \$7 gain to the receiver. The payoffs are two possible divisions of \$12. This is treatment 4.

In the matched gains and losses sessions, the net payoff to subjects was identical. For example in when \$20 was being divided a lie always results in the sender receiving \$10 more than telling the truth, assuming their message is trusted by the receiver. When \$12 was being divided, lying increased the sender's payoff by \$2 if they were trusted.

3.3 Receivers

After getting a message from the sender receivers choose which payoff both subjects will receive. In this environment receivers are given no information beyond the messages from senders. Receivers have no information about the nature of potential payoffs, even whether or not the sender has an incentive to lie. Essentially, receivers are operating in an informational vacuum.

3.4 Survey

After making their choices all subjects, both senders and receivers, were asked to complete a short survey. This survey was designed to elicit personal information from subjects and to allow us to control for a number of characteristics that have been identified in both psychology and experimental economics has being related to the propensity to lie. The survey collected basic demographic information, information on religious importance and observance, family status, and student debt. The survey is included as Appendix 1.

4. Results

4.1 Senders

Four hundred subjects recruited from introductory economics classes participated in this experiment. Two hundred participated as senders and two hundred as receivers. Three subjects were dropped from the experiment for poor understanding of the instructions and several failed to return the decision sheets at the end of the experiment. This leaves us with data from 191 senders and 192 receivers².

101 of the 191 senders (52.88%) sent inaccurate messages. In the gains treatments 24 of 48 (50%) of subjects lied when to increase their payoff by \$10 (Treatment 1), and 28 of 48 (58.3%) of subjects lied to gain \$2 (Treatment 3). In the losses treatments 29 of 46 (63%) of subjects lied to avoid a loss of \$10, while 20 of 49 (41%) of subjects lied to avoid a loss of \$2. In the two gains treatments combined 52 of 96 (54%) while in the losses treatments 49 of 95 (52%) subjects lied.

A simple logit regression is used to control for the impact of various factors on the decision to send an inaccurate signal to another anonymous subject. Table 1 below includes the results from the reduced form analysis. Variables that are omitted, but were collected were found not to have a significant impact on the decision to lie³.

Table 1: Logit Regression Results - Lying

Log Likelihood	-115.946		Observations	187
			Pseudo R ²	0.1032
Variable	Coefficient	P> z	Marginal Effect	P> z

² The messages from the senders whose actions were dropped from analysis for poor understanding of the instructions were still sent to receivers.

³ The survey collected data on the subject's sex, age, faculty of study, grade point average, the importance of their religion, the number of hours per week devoted to religious observance, if their parents were divorced and if so how old were they when this happened, if they were raised by a single parent, the socio-economic status growing up, and finally if they had any student loans or other debt.

Young (Age<22)	0.933	0.034	0.223	0.025
Business Major	0.993	0.007	0.243	0.005
Arts Student	0.933	0.072	0.218	0.046
Divorced Parents	1.213	0.054	0.273	0.022
Raised by a Single Parent	-2.116	0.012	-0.433	0.000
Religious Observance (Hrs)	0.085	0.150	0.021	0.150
Low Incentives	-1.144	0.016	-0.277	0.011
Incentives as Gains	-0.898	0.058	-0.220	0.050
Low Incentives as Gains	1.617	0.013	0.360	0.003

This slightly more complex analysis suggests some interesting relationships between incentives, personal characteristics, and the decision to lie. First, in this sample the sex of the subject is unrelated to the decision to lie, contrary to earlier findings (Dreber & Johannesson 2008, Erat and Gneezy 2009). Dropping sex from the estimation has no meaningful impact on the other parameter estimates.

Subjects in the traditional age range for undergraduate programs are more likely to lie (marginal effect significant at the 5% level) than those pursuing undergraduate education as mature students. We have no obvious explanation for this observation. Age was included after being identified by the psychology literature as a factor in explaining dishonest behaviour in children.

Subjects in both Arts (marginal effect significant at the 5% level) and Business (marginal effect significant at the 1% level) were much more likely to lie than those in other disciplines. Business students have been found to be more likely to engage in dishonest behaviour than other students in surveys of academic dishonesty (Bernardi et al. 2004,

Smyth and Davis 2004). The fact the Arts students are more likely to lie in this environment is somewhat more is less obvious, but can be explained by the fact that many Arts students in introductory economics classes consider themselves future business students.

Subjects reporting divorced parents show a remarkable increase in the likelihood of their sending false messages (marginal effect significant at the 5% level) . This fits with the findings of Turkat (1994) who finds evidence that unamicable divorce increases a child's likelihood of anti-social behaviour. Those children raised by a single parent, on the other hand were more significantly less likely to lie (marginal effect significant at the 1% level). These results should be treated with some caution as there were few children of divorced parents in the sample (25) and even fewer raised by a single parent (14).

Neither the importance of a subject's religion to them, nor their time spent in religious observance was a significant predictor of a subject's likelihood of lying (marginal effect not significant at the 10% level). This is somewhat surprising as most religions promote honesty as a virtue.

Lower incentives resulted in a lower propensity to engage in deception (marginal effect significant at the 5% level). This is consistent with Gneezy (2005). Subjects facing an increase in their payoff of just \$2 were less likely to send false messages than subjects facing an incentive of \$10. This suggests there is a personal cost to lying, and that small incentives do not meet the necessary threshold for many subjects. This is not the only interpretation of this type of result, however. Further, Hurkens and Kartick (2009) suggest that behaviour in this environment is driven by preferences over outcomes not a cost of deception.

Framing incentives as gains also reduced the likelihood of a subject lying (marginal effect significant at the 5% level). This supports the main hypothesis of the paper that subjects are more likely to lie in order to avoid a loss than in pursuit of a gain. The extra incentive provided by the threat of a loss induced more subjects to send false messages. The interaction between framing the payoffs as gains and low incentives is somewhat unexpected. When low incentives are combined with framing the payoffs as gains subjects were more likely to send inaccurate messages than in other cases (marginal effect significant at the 1% level). This result warrants further investigation, particularly focusing on the salience of lower incentives.

4.2 Receivers

The experimental environment also allows for the consideration of trust. Receivers must make a choice with no information about the payoffs other than the sender's signal. The actions of all receivers are pooled as receivers had no way of knowing anything about the treatment variables. 139 of 192 (72.4%) of receivers chose the action recommended by the sender. This level of trust is consistent with other experiments.

Just as lying may be related to a wide variety of other factors, trust is likely to be influenced by a large number of personal characteristics. Receivers were asked to fill out the same survey as senders. We estimate the impact of these characteristics on the trust exhibited by receivers. The reduced logit estimation results are presented in Table 2.

Table 2: Logit Regression Results - Trust

Variable	Coefficient	P> z	Marginal Effect	P> z
Log Likelihood	-104.797			
			Observations	189
			Pseudo R ²	0.0575
Business Major	-0.773	0.081	-0.156	0.089
Arts Student	-0.835	0.056	-0.172	0.065

Religious Observance (Hrs)	-0.030	0.270	-0.006	0.269
Divorced Parents	-1.129	0.011	-0.269	0.015
Raised by a Single Parent	1.123	0.077	0.174	0.021
Economic Status	0.320	0.156	0.062	0.154

Neither the sex nor the age of the receiver had an impact on the likelihood of the receiver trusting the message they received. The fact that male and female subjects were equally likely to trust the information they received is not surprising given there was no difference in the likelihood of lying by sex. That age played no significant role is more surprising, as younger subjects were more likely to lie than older ones.

Both Business and Arts students were less likely to trust their messages than students in other faculties, though the marginal effects are only significant at the 10% level. The level of distrust is likely due to subjects projecting themselves into the role of the sender. As Business and Arts students were more likely to lie than other students, it makes sense that the same sort of student would be more distrusting than others.

Religious importance and time spent in religious observance had no significant impact (marginal effect not significant at the 10% level) on the trust of subjects. We had expected that religion would make people more trusting as such people could be expected to have more faith than others. While the sign of the effect was negative, as we expected, it is not significantly different from zero.

Subjects with divorced parents were less trusting than other subjects (marginal effect significant at the 5% level). This matches the findings of the psychology literature (Turkat, 1994). Subjects raised by a single parent were actually more trusting than others

(marginal effect significant at the 5% level). These results should be interpreted with care as there is substantial overlap in the sets. Of the 26 subjects who reported being raised by a single parent, 19 also reported having divorced parents.

Finally, socioeconomic status when growing up had no significant, at the 10% level, impact on trust. We had initially speculated that those of higher socioeconomic status during their formative years would be more trusting than those of lower status. This was not the case.

5. Discussion

Deceit and lying are pernicious in human interaction. Lying makes the specialization and trade at the heart of economic development virtually impossible, as lying converts a voluntary transaction into an involuntary one. Yet in a one shot environment dishonesty is clearly advantageous. The fact that not all people lie in every situation that could be modeled as a one shot game makes it clear that lying has costs beyond those directly related to the immediate situation.

Gneezy (2005) explores this relationship in a controlled experimental environment and concludes that people are more likely to lie for a large gain than a small gain. This is consistent with the idea of costly lying. This environment has been utilized by other researchers to explore other aspects of the decision to lie. Dreber and Johannesson (2008) consider the relationship between sex and lying and find males are more likely to lie for a monetary gain. Erat and Gneezy (2009) consider the impact of different incentives and find that some people, particularly females, are more likely to lie to help an anonymous partner than others.

These and other experiments present the incentives to subjects as gains. Based on the work of (Tversky & Kahneman 1986, Tversky & Kahneman 1991, Tversky & Kahneman 1992, Benartzi & Thaler 1995, Thaler et al. 1997), there is reason to believe the prospect of a loss is more likely to induce lying than the prospect of a gain. This hypothesis had not yet been tested.

In this paper we consider the impact of potential losses on dishonesty. Subjects also completed a survey which identified various personal characteristics. The findings have a wide variety of implications.

The logit analysis supported the hypothesis that people are in fact more likely to lie to avoid a loss than in pursuit of a gain. This has dramatic implications for enforcement and monitoring, particularly in the private sector. Instances of fraud are more common as the economy enters and economic downturn than in a boom (Povel et al. 2007). This is likely due to corporate leadership attempting to avoid losses. Our findings also have implications for electoral politics as incumbents would be more likely to lie than challengers.

Unlike in other research, the sex of the subject was statistically unrelated to the likelihood of dishonesty. Previous research has been conducted in Sweden (Dreber and Johannesson 2008), the U.S. (Erat and Gneezy 2009) and Japan (Aoki, et al. 2010). While Swedish and American women are more honest than their male counterparts, Japanese and Canadian women are just as dishonest as males.

Faculty of study was found to be a strong predictor of lying. Students in business and arts were more likely to lie than students in other disciplines. The fact that business students were more likely to lie matches the results of some unmotivated surveys of

students' attitudes toward academic dishonesty (Bernardi et al. 2004, Smyth and Davis 2004). The arts students in the sample likely considered themselves economics students and thus may not be that different than business students.

The family status of the subjects also had an impact on their likelihood to lie. Subjects of divorced parents were more likely to lie than those whose parents were not divorced.

Being raised by a single parent, on the other hand reduced the propensity for deception by approximately. The impact of divorce on dishonesty behaviour is consistent with Turkat (1994), while the positive impact of being raised by a single parent is somewhat surprising.

Religious importance and time spent in religious observance were unrelated to the propensity to lie. This result remains something of a mystery as we expected religion to reduce dishonesty.

Low incentives reduced the likelihood that a subject would lie. In this experiment a subject who could increase their payoff (assuming their message was trusted) by either \$10 or \$2. Subjects who stood to gain only \$2 were less likely to lie than more richly motivated subjects.

There was a somewhat perverse effect of the interaction between low incentives and framing incentives as gains. The interaction effect was found to be positive. This may indicate that salience was not achieved in this treatment and warrants further research.

The experimental design also includes data on trust as the receivers have no information other than the messages they receive.

In spite of accepted wisdom, women were found to be no more trusting than men.

Faculty of study has a meaningful relationship to trust with business and arts students

being less trusting than others. Subjects whose parents were divorced were much less trusting than those whose parents were still together. We were again surprised to find that subjects raised by a single parent were more trusting than those raised by two parents.

The findings of this research and other literature suggest a number of ways in which this research could be extended. The vouchers issued to subjects may not have entirely changed their reference points, resulting in a smaller effect than we would expect otherwise. Instead vouchers might be issued and re-enforced by asking subjects to list 5 things they might do with the money. Alternately, it might be useful to have subjects earn the money through some simple task, like solving simple math problems or searching for pairs of numbers that add up to some total as in Mazar, Amir, and Ariely (2008). Another option would be use the protocol developed by Oxoby and Morrison (2010) in which students earn money through a simple task and retain those funds for a period of time.

Other personal characteristics that were not explored in this experiment may also have an impact on a person's likelihood to engage in deception. In particular a number of researchers in psychology and business (Kashy and DePaulo 1996, Tang and Chen 2008, Bloodgood et al. 2010) have identified "machiavellianism" as having strong links with dishonest behaviour for person gain.

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Appendix 1. Survey

Experiment Questionnaire

Subject number: _____

Please fill out the questionnaire to the best of your ability. Also, please be honest in your answers. Your identity will not be linked to your responses.

1. What is your sex? Please circle “male” or “female” below:

Male Female

2. What is your age?

_____ years old

3. What is your declared major, if any? What is your faculty and degree program?

4. What is your cumulative grade point average at the University of Regina? This is the average of all the grades you have received in classes at the University of Regina. Please enter a percent between 0 and 100. If you aren't sure, please enter your best estimate.

_____ %

5.a) How important is your religion to you? Please circle a value below. The values range from 1 (not very important), to 7 (extremely important).

1 2 3 4 5 6 7

Not very Somewhat Extremely

b) On average, how much time a week do you spend in religious observance? This includes any time in prayer, church, or other religious activities. Please answer in “hours per week”

_____ hours per week

6. a) Are your parents divorced? Please circle yes or no below:

Yes No

b) If “yes”, how old were you when they divorced? Please enter your age at the time of the divorce.

_____ years old.

7. Were you raised by a single parent? Please circle yes or no:

Yes No

8. Thinking of your family's financial status or socio-economic status while growing up, please circle what best describes it from the five options below:

low income middle income high
income lower-middle income upper-middle income

9. a) Do you have any student loans or any other debts? Please circle yes or no.

Yes No

b) If “yes”, what is the amount of your student loans and debts?

_____ dollars