An Experimental Investigation of Motivation Crowding Theory

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Abstract

A large amount of research has debated the effects of extrinsic incentives on altruistic motivation. This paper contributes to this discussion by examining motivation crowding theory through a unique experimental design. The methodology allows the author to measure the magnitude of the crowding out effect with a level of precision that has not been achieved in the past. The paper focuses on the impacts of financial incentives on altruistic behavior in the form of a donation to the Red Cross. The results reveal that crowding out does occur and that the magnitude of the effect is equal to $1.75. This effect is further analyzed in relation to several sub-groups within the sample.
Acknowledgements

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<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Introduction</td>
<td>5</td>
</tr>
<tr>
<td>II. Literature Review</td>
<td>7</td>
</tr>
<tr>
<td>III. Experimental Design</td>
<td>13</td>
</tr>
<tr>
<td>IV. Results</td>
<td>19</td>
</tr>
<tr>
<td>V. Discussion and Conclusion</td>
<td>23</td>
</tr>
<tr>
<td>VI. Appendix</td>
<td>27</td>
</tr>
<tr>
<td>VII. References</td>
<td>29</td>
</tr>
</tbody>
</table>
I. Introduction

In the real world, individuals are motivated by both self-interest and a desire to help others. Since individuals can be motivated by altruism and material self-interest, there is a large debate focusing on the interaction between these types of motivation. This discussion has led to two differing opinions concerning the effects of economic extrinsic incentives on individuals’ behavior and decision-making processes. One outlook promotes the use of extrinsic incentives to increase pro-social behavior. Under these schemes, individuals are rewarded with a monetary or non-monetary prize if they exhibit altruism or are punished if their behavior is anti-social. These incentives aim to align individuals’ self-interest with the public interest. On the other side of the debate, however, researchers question the impact that these extrinsic incentives have on natural, intrinsic altruism. Social norms in communities inspire individuals to pursue pro-social behavior even when it is not in their own best material self-interest because, in general, humans believe that it is right to help others. These social norms create a sense of community without the need for reciprocity and foster natural, intrinsic altruism.

After considering the influence of social norms, Richard Titmuss published a book in 1970 titled *The Gift Relationship*. Titmuss argues that monetary compensation for blood donors would decrease donation levels. The introduction of this effect, labeled motivation crowding theory, has inspired researchers to examine the impacts of extrinsic incentives on intrinsic motivation. Motivation crowding theory proposes that extrinsic incentives could decrease levels of pro-social behavior. The theory asserts that, when extrinsic incentives are introduced into altruistic decisions, market norms will crowd out social norms and dominate the interactions. Through this perspective, when extrinsic incentives...
are not present, individuals judge tasks through the generous, volunteering lens of social norms and exhibit altruism because society suggests that it is correct. Motivation crowding theory claims, however, that when extrinsic incentives are introduced, individuals will determine their behavior through a stricter, less emotional, market-based cost-benefit analysis. Individuals’ pro-social behavior may decrease in the presence of market norms because they feel that the benefit of the financial incentive is not worth the cost of the behavior, such as time or effort. When guided by social norms, individuals do not consider these costs as much because they are motivated to be good citizens and maintain their connection with society; however, market norms cause them to compare the costs and benefits. Motivation crowding theory asserts that, when market norms and social norms collide, market norms will dominate the decision and social norms will no longer guide individuals’ actions. This change in the source of motivation could cause altruism to decrease.

Many researchers have attempted to decipher this effect. These projects have all focused on comparing behavior when subjects are motivated by social norms and when they are motivated by both social and market norms. In these situations, the potential crowding out of social norms decreases altruistic behavior, while the introduction of extrinsic incentives motivates subjects to increase altruistic behavior. These two effects influence individuals in opposite directions, and researchers are unable to separate or measure the magnitudes of the influence of each form of motivation. This paper seeks to supply further experimental results to analyze the validity of motivation crowding theory. The study will observe the amount of money that individuals are willing to accept to complete a boring task when they are motivated by a personal monetary payment or both a
payment and altruism. This design differs from past research because it contains a condition in which subjects are only motivated by a personal payment, removing the influence of altruism. By including this condition, the study is able to scrutinize the crowding out effect more precisely and separate the two influences that impact motivation in opposite directions. This close analysis of motivation crowding theory will expand knowledge on the topic and enable policymakers to efficiently utilize extrinsic incentives.

II. Literature Review

There is a large amount of research dedicated to investigating the impact of extrinsic incentives on individuals’ performance and behavior. These studies examine subjects’ performance on intrinsically motivating tasks with and without extrinsic incentives. Since students have intrinsic motivation to perform well in school, researchers often scrutinize the effects of paying students for improved academic results. Two studies find that the imposition of extrinsic incentives decreases academic performance (Gneezy & Rustichini 2000, Fryer 2011), while Sharma (2011) uncovers an increase in scores following payment. Leuven et al. (2010) discovers that payment increases the performance of high-ability students, but damages low-ability students. Additionally, Garibarino and Slonim (2005) find that incentives do not have a significant effect on performance, but that subjects’ performance worsens once the incentives are removed. Interesting gender differences are also revealed. Two studies show that these incentives can be successful for females, but have no effect on male performance (Angrist & Lavy 2009, Kremer et al. 2009).
Furthermore, there are varied results when examining intrinsically motivating tasks other than academic performance, such as solving a difficult puzzle. While many experiments conclude that payment is associated with a clear decrease in performance (Pritchard et al. 1997, Anghelcev 2008, Torgler et al. 2008, Ariely et al. 2009, Huck et al. 2012), some research also finds no change in performance (Arnold 1976, Hung et al. 2011). Since these studies compare performance on intrinsically motivating tasks with and without extrinsic incentives, the papers are unable to determine whether crowding out occurs when there is no change or an increase in performance. In these situations, it is possible that intrinsic motivation decreases, but that motivation from the extrinsic factor is large enough to nullify or overcome the reduction. This paper differentiates itself from the past literature with its ability to examine this possibility.

Other researchers focus on the impact of extrinsic punishments on performance. Most of these studies compare subjects’ conservation behavior in public goods games when there is no extrinsic incentive and when there is a punishment scheme. Many of these papers find that large penalties increase cooperation (Tyran & Feld 2006, Rodriguez et al. 2008, Lopez Perez 2008, Brick & Visser 2010), while also revealing that small punishments increase selfish behavior (Cardenas et al. 2000, Gneezy & Rustichini 2000, Tyran & Feld 2006, Rodriguez et al. 2008, Lopez Perez 2008, Brick & Visser 2010, Holmas et al. 2010). Studies on extrinsic financial punishments do not reach a clear conclusion, however, as eight other studies find that these mechanisms are associated with varied results; three studies determine that altruism increases when subjects are punished for anti-social behavior (Masclet et al. 2003, Reeson & Tisdell 2008, Herrmann et al. 2008), three observe a decrease in cooperation under these schemes (Belkin 2002, Vollan
2008, Goeschl & Perino 2012) and two do not ascertain a difference in behavior between subjects who are punished and those who are not punished (Vollan 2008, d’Adda 2011). Finally, Halvorsen (2008) finds that introducing a fee to punish individuals who do not recycle does not crowd out recycling behavior.

These studies examining extrinsic punishments follow similar designs to the papers described earlier; therefore, they cannot prove or disprove motivation crowding theory when cooperation does not change or increases once a punishment is introduced. Since small punishments appear to decrease intrinsic motivation, it is probable that large punishments have the same impact. Small punishments do not have a large enough influence to counteract the reduction in intrinsic motivation; therefore, experiments examining smaller punishments find a decrease in performance and cooperation. When punishments are large, however, the extrinsic incentives motivate the subjects more than small punishments. In this situation, the positive influence from the punishment can overcome or nullify the decrease in intrinsic motivation and result in an overall increase or no change in pro-social behavior. Consequently, it is possible that crowding out still occurs in studies that find an increase or no change in pro-social behavior.

Finally, there has been significant research dedicated to examining whether positive extrinsic incentives crowd out altruism. This section of the research studies levels of pro-social behavior on intrinsically altruistic tasks with and without a reward regime. Several papers find that non-monetary rewards decrease altruistic behavior (Warneken & Tomasello 2008, Sexton 2010, Newman & Shen 2012), while other studies focus on the impact of monetary rewards. Many researchers examine the influence of extrinsic incentives on blood donation. These studies reach varied conclusions concerning the
crowding out effect. Lacetera and Macis (2010) and Costa-Font et al. (2012) find that monetary payments decrease blood donations, while non-monetary rewards do not have a large effect in either direction. In a subsequent study, however, Lacetera et al. (2011) reveals that alerting previous donors of a monetary reward increases the likelihood of them making a future donation. Lastly, Mellstrom and Johannesson (2008) expose gender differences, finding that instituting a monetary payment decreases donations from women, but has no effect on male subjects.

Aside from blood donation, research tests motivation crowding theory in relation to several other altruistic activities. Fiorillo (2011) asserts that monetary rewards increase the amount of time that Italian individuals dedicate to volunteering and that these incentives do not affect intrinsic motivation. Also examining volunteers, Carpenter and Myers (2007) present data revealing that monetary incentives have a positive relationship with the time donated by volunteer firefighters in Vermont, but that this connection declines with reputational concerns. This finding suggests that monetary incentives can crowd out the firefighters’ image motivation. Furthermore, Gneezy and Rustichini (2000) find that individual payments decrease the amount of money that high school students collect for a charity. Conversely, utilizing a public goods game, Narloch et al. (2012) arrives at more nuanced conclusions. This paper conducts experiments with Bolivian and Peruvian farmers in which the subjects choose how much land to allocate to conservation. The study finds that providing collective rewards for conservation behavior is associated with an increase in free riding, while instituting individual rewards increases cooperation and conservation. Moreover, three studies reveal a clear increase in donations when individuals are rewarded with charitable tax deductions (Boskin & Feldstein 1977,
Clotfelter 1980, Bönke et al. 2010). Venkataramani et al. (2012), however, concludes that tax deductions for living organ donation have not affected donation levels. Finally, two studies find that payment decreases subjects’ civic duty to accept the construction of a nuclear waste repository in their community (Kunreuther et al. 1989, Frey & Oberholzer-Gee 1997).

While these studies expose important information concerning the effects of extrinsic incentives on pro-social behavior, they all manipulate an inherently altruistic task. For this reason, they are unable to precisely measure the crowding out effect. These studies compare subjects’ behavior when they are motivated by altruism and when they are motivated by both altruism and an extrinsic incentive. When researchers measure the change in behavior between these two conditions, they observe the sum of extrinsic and intrinsic motivation. These studies are not able to separate the two types of motivation; therefore, they do not identify the magnitude of the impact of each type of motivation on subjects’ behavior. Due to this design, it is possible that the crowding out of social norms is concealed in the results of studies that do not find that extrinsic incentives decrease altruistic behavior. In these situations, market norms may crowd out social norms, but the extrinsic incentives may still have a large enough positive influence to overcome this decrease in altruistic motivation. If researchers measure behavior with an extrinsic incentive but without altruism, they could separate the influence of each type of motivation.

A study by Ariely et al. (2007) is most similar to the experiment in this paper. The authors’ research design manipulates a task that is not inherently altruistic; however, they continue the trend of comparing performance between groups who are all influenced by
intrinsic motivation. The study measures performance on physical tasks, clicking a button and riding a bike, and adds altruistic motivation; a donation is made to charity for each click or mile. The authors uncover the importance of image motivation, but still compare performance when there is always altruistic motivation; therefore, they do not address the missing aspect of the past literature.

Furthermore, the data could be affected by the fact that there are physical constraints on the subjects’ ability to complete these tasks. The researchers realize that it is possible that the subjects reach a physical limit when they are motivated exclusively by altruism. If this were true, the subjects would not be able to increase their number of clicks once the personal payment is combined with altruistic motivation, even if they are more motivated. In an attempt to address this confound, the authors run a condition in which the subjects are awarded with a personal payment for the number of clicks they complete. They find that there are significantly more key presses in this treatment than in the charity condition without an extrinsic incentive, causing them to assert that the subjects are able to click more if the payment motivates them to do so. Although the authors conduct this condition without altruistic motivation, they do not include it in their main analysis examining the presence of crowding out; consequently, they still cannot separate the influence of the two forms of motivation.

Moreover, it is still possible that the subjects’ ability to make each click decreases as the number of clicks increases. If the subjects experience this diminishing ability to click, the experiment is biased towards concluding that crowding out occurs. In this situation, the subjects’ inability to increase their clicks may be interpreted as a lack of motivation to increase their clicks. It would appear as if the combination of altruism and
extrinsic incentives does not motivate the subjects as much as expected, when, in fact, the subjects are unable to reveal their full amount of motivation in their clicks. As a cause of these potential physical constraints, the authors’ experiment cannot be used to uncover the hidden crowding out effect. Instead, subjects should perform a task without physical constraints and a condition with only extrinsic motivation should be included in the main analysis. The experimental design in this paper differs from the past research because it studies a fixed task and eliminates the bias resulting from physical constraints. Overall, the past literature presents varied conclusions concerning the effects of extrinsic incentives on intrinsic motivation. Due to the experimental design of these studies, the previous research does not measure the crowding out effect as precisely as this experiment.

**III. Experimental Design**

This experiment offers each subject a multiple price list in which he/she must make choices between two columns with different options. There are three treatments in the experiment. The multiple price lists for each treatment are presented in Figure 1. In the first treatment, which determines IP₁, the subject chooses between donating $5.00 to the Red Cross and receiving a varying personal payment. The second treatment, determining minWTA₂, offers subjects the options to leave the experiment or to sit in silence and receive a varying personal payment. While subjects sit in silence, they cannot leave the room, sleep, or participate in any activities, such as using their phone or computer, reading, or writing. In the final treatment, determining minWTA₃, subjects choose between leaving the experiment or sitting in silence, having $5.00 donated to the Red Cross, and receiving a varying personal payment. In each treatment, the first option in the
right column contains a personal payment of $0.00, while the final option offers the largest amount of payment. The maximum payment in the first treatment is equal to $10.00 and the maximum payments in the second and third treatments are each equal to $15.00. Subjects must choose one column in each row of the multiple price list. The responses to these multiple price lists are used to calculate subjects’ indifference points for the first treatment ($IP^1$) and minimum willingness to accept for the second and third treatments ($\text{minWTA}^2$, $\text{minWTA}^3$). The experimenter concludes that a subject’s indifference point or minimum willingness to accept occurs when he/she switches from the left column to the right column. These variables are assumed to be $0.25$ less than the first value of personal payment for which the subject prefers the right column.

Figure 1: Decision Screenshots

(a) Treatment 1, determining $IP^1$
(b) Treatment 2, determining minWTA$^2$

- Leave the Experiment
- Sit in silence for 15 minutes and be paid $0.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $0.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $1.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $1.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $2.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $2.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $3.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $3.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $4.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $4.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $5.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $5.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $6.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $6.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $7.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $7.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $8.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $8.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $9.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $9.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $10.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $10.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $11.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $11.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $12.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $12.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $13.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $13.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $14.00
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $14.50
- Leave the Experiment
- Sit in silence for 15 minutes and be paid $15.00

(c) Treatment 3, determining minWTA$^3$

- Leave the Experiment
- Sit in silence for 15 minutes, be paid $0.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $1.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $1.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $2.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $2.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $3.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $3.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $4.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $4.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $5.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $5.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $6.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $6.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $7.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $7.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $8.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $8.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $9.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $9.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $10.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $10.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $11.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $11.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $12.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $12.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $13.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $13.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $14.00, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $14.50, and have $5.00 donated to the Red Cross
- Leave the Experiment
- Sit in silence for 15 minutes, be paid $15.00, and have $5.00 donated to the Red Cross
From the results of Treatment One, the experimenter determines the amount of personal payment, IP₁, that makes subjects indifferent between receiving that payment and donating $5.00 to the Red Cross. Since subjects are indifferent between these two values, a $5.00 donation to the Red Cross should motivate subjects as much as receiving an IP₁ dollar personal payment. The minimum willingness to accept in Treatment Two represents the smallest payment for which the subject is willing to complete the boring task. Similarly, the minimum willingness to accept in Treatment Three reveals the smallest payment for which the subject is willing to complete the boring task if $5.00 are also donated to the Red Cross. It is important to note that a lower minimum willingness to accept signifies greater motivation because subjects are willing to perform the boring task for a smaller payment. An equation can be constructed using the indifference points and minimum willingness to accept. If there is no crowding out,

\[ \text{minWTA}^2 - \text{IP}^1 = \text{minWTA}^3 \]

In this equation, when subjects receive a personal payment and money is also donated to charity, as it is on the right side, they should be even more motivated to choose the right column over the left column. A subject’s minimum willingness to accept should decrease compared to when he/she is only motivated by personal payment; he/she should be willing to perform the boring task for less money, since the motivation and benefits are greater. In Treatment Three, the $5.00 donation to the Red Cross introduces social norms into the decision and, if crowding out does not occur, both the altruistic motivation and personal payment influence the subject to decrease minimum willingness to accept. Subjects receive the same amount of motivation from a $5.00 donation to the Red Cross and a personal payment of IP₁ dollars; therefore, the decrease in minimum willingness to
accept caused by adding the $5.00 donation to the Red Cross in Treatment Three will be equal to the decrease that would occur if subjects were paid $P_1$ more dollars. Consequently, minWTA_3 should be $P_1$ dollars less than minWTA_2.

If there is crowding out, however, the right side of this equation will be greater than the left side. When crowding out occurs, social norms do not have as much influence as expected, therefore subjects’ minimum willingness to accept will be greater than predicted; they will require more money to perform the task. The additional $5.00 donation to the Red Cross on the right side of the equation will not motivate the subjects as much as an $P_1$ dollar personal payment. Since the personal payment is present in the right column of Treatment Three, market norms influence the subjects’ decisions. If market norms dominate social norms, introducing social norms through the Red Cross donation will not cause subjects to decrease their minimum willingness to accept as much as expected; the impact of the social norms will not be as large as predicted. This means that minimum willingness to accept will decrease by less than $P_1$ dollars, and the equality will not hold. The size of the crowding out effect is equal to the right side of this equation minus the left side of this equation: minWTA_3 – (minWTA_2 - $P_1$). This subtraction reveals the difference between the actual minimum willingness to accept in Treatment Three and the predicted minimum willingness to accept if crowding out does not occur.

Experimental Procedure

Experimental sessions were conducted at Haverford College’s Experimental Economics Laboratory, and subjects were recruited using the ORSEE (Greiner, 2003) human subject recruitment system. All of the subjects were undergraduate students at Haverford College and participated in one treatment. 21 subjects participated in Treatment
1, 20 subjects participated in Treatment 2, and 29 subjects participated in Treatment 3\(^1\). A total of seven sessions were conducted, with between seven and 13 subjects in each. Subjects were seated at computer terminals and separated by opaque partitions. The experiment was presented to subjects through the experimental economics software zTree (Fischbacher, 2007).

After entering the experiment, subjects are given written instructions to follow along as the experimenter reads them aloud. Once the subjects complete all of their decisions, they are randomly assigned to a payment group. Regardless of their payment group, every subject receives a $5.00 show up fee in all three treatments. In the first treatment, there is a two-thirds probability of being assigned to receive the $5.00 show up fee and exit the experiment. There is a one-third probability of being assigned to the second payment group, in which subjects are paid based on their decisions. In this group, the computer randomly selects one of the options from the multiple price list for each subject and pays the subject according to his/her choice in this decision. In the second and third treatments, subjects are assigned to one of three payment groups with equal probability. The first group receives the $5.00 show up fee and exits the experiment. The second group receives an additional $15.00 after sitting in silence for 15 minutes. The third group’s payment is determined by their decisions in the same manner as the first treatment. This payment group randomization is important in order to maintain anonymity and reduce experimenter-demand effects. Since subjects can be randomly assigned to perform the task or exit the experiment, it is less probable that they feel as if the

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\(^1\) Seven of these subjects were excluded from the data analysis. Four subjects’ answers were not rational because they switched between the left and right column more than once (two subjects in Treatment One and two subjects in Treatment Three). Three subjects in Treatment Two did not have logical revealed preferences because they selected the option to perform the boring task even when they were not offered any money.
experimenter or other subjects are judging them based on their decisions. This helps to ensure that subjects provide honest answers. The experiment is double-blind; the experimenter does not know the subjects’ payment group assignment or how much money they receive.

IV. Results

Summary Statistics

The main variables of interest in this experiment are the indifference point from Treatment One (IP$^1$), the minimum willingness to accept from Treatment Two (minWTA$^2$), and the minimum willingness to accept from Treatment Three (minWTA$^3$). The summary statistics for these variables are presented in Table 1.

Table 1: Summary Statistics of Indifference Point and Minimum Willingness to Accept

<table>
<thead>
<tr>
<th>Variable</th>
<th># of Obs.</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP$^1$</td>
<td>19</td>
<td>4.09211</td>
<td>4.75</td>
<td>1.92247</td>
<td>0.25</td>
<td>6.75</td>
</tr>
<tr>
<td>minWTA$^2$</td>
<td>17</td>
<td>4.45588</td>
<td>4.75</td>
<td>2.44348</td>
<td>0.25</td>
<td>9.75</td>
</tr>
<tr>
<td>minWTA$^3$</td>
<td>27</td>
<td>2.28704</td>
<td>1.75</td>
<td>2.33669</td>
<td>0</td>
<td>8.75</td>
</tr>
</tbody>
</table>

The most notable information revealed by these statistics is the similarity between the means of IP$^1$ and minWTA$^2$. Moreover, the medians of these two variables are both equal to $4.75. This means that subjects are indifferent between donating $5.00 to the Red Cross and receiving a $4.75 personal payment. Additionally, subjects are willing complete the boring task if they are compensated with at least $4.75. It also important to note that the mean and median of minWTA$^3$ are smaller than the mean and median of minWTA$^2$. This reveals that subjects are more motivated to decrease their minimum willingness to
accept when there is both altruistic and financial motivation as compared to when there is solely extrinsic motivation. This difference confirms that the payment does not crowd out all of the altruistic motivation; however, a more extensive analysis will reveal whether there is partial crowding out. The median of minWTA\(^3\) is $1.75; subjects are willing to perform the boring task for at least $1.75 if $5.00 are also donated to the Red Cross.

Table 2: Summary Statistics Separated by Gender

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistic</th>
<th>Male</th>
<th>Female</th>
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<tr>
<td></td>
<td># of Obs.</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>IP(^1)</td>
<td>Mean</td>
<td>4</td>
<td>4.194444</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>4.75</td>
<td>4.75</td>
</tr>
<tr>
<td></td>
<td>Std. Dev.</td>
<td>1.829542</td>
<td>2.127858</td>
</tr>
<tr>
<td></td>
<td>Min</td>
<td>.25</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>6.75</td>
<td>6.75</td>
</tr>
<tr>
<td>minWTA(^2)</td>
<td># of Obs.</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>3.972222</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>4.75</td>
<td>4.75</td>
</tr>
<tr>
<td></td>
<td>Std. Dev.</td>
<td>2.001735</td>
<td>2.9032</td>
</tr>
<tr>
<td></td>
<td>Min</td>
<td>.25</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>6.75</td>
<td>9.75</td>
</tr>
<tr>
<td>minWTA(^3)</td>
<td># of Obs.</td>
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<td></td>
<td>Mean</td>
<td>2.5</td>
<td>2.020833</td>
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<td></td>
<td>Median</td>
<td>1.75</td>
<td>1.75</td>
</tr>
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<td>Std. Dev.</td>
<td>2.788689</td>
<td>1.693766</td>
</tr>
<tr>
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<td>Min</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>8.75</td>
<td>4.75</td>
</tr>
</tbody>
</table>

Although past studies have found gender differences between male and female participants, Table 2 reveals that the variables of interest do not differ by a large amount when separated by gender. In fact, the medians of each variable are the same for both genders and are equal to the medians for the entire population. Wilcoxon rank-sum
(Mann-Whitney) tests confirm that the underlying distributions of these variables for males and females are not significantly different from one another².

Table 3: Statistics Separated by Major and GPA

<table>
<thead>
<tr>
<th>Variable</th>
<th>Social Science</th>
<th>Humanities</th>
<th>Natural Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP¹</td>
<td># of Obs.</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Median</td>
<td>4.75</td>
<td>3.75</td>
<td>4.25</td>
</tr>
<tr>
<td>minWTA²</td>
<td># of Obs.</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Median</td>
<td>4.25</td>
<td>0.25</td>
<td>5</td>
</tr>
<tr>
<td>minWTA³</td>
<td># of Obs.</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Median</td>
<td>1.75</td>
<td>2.25</td>
<td>0.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>4.0 - 3.5</th>
<th>3.4 - 3.0</th>
<th>2.9 - 2.5</th>
<th>2.4 - 2.0</th>
<th>1.9 - 1.5</th>
<th>1.4 or Below</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP¹</td>
<td># of Obs.</td>
<td>12</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Median</td>
<td>4.75</td>
<td>4.75</td>
<td>4.75</td>
<td>N/A</td>
<td>1.25</td>
<td>N/A</td>
</tr>
<tr>
<td>minWTA²</td>
<td># of Obs.</td>
<td>11</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Median</td>
<td>4.75</td>
<td>4.25</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>minWTA³</td>
<td># of Obs.</td>
<td>18</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Median</td>
<td>2</td>
<td>0.25</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

The experiment also collects data describing subjects’ major and GPA. Table 3 presents the statistics of the three main variables separated by major and GPA³. It is necessary to note that there were very few observations per variable in each type of major and GPA. Observations are especially low in the humanities major and the GPA ranges including 0.0 to 2.9. Since the sample size is small, the statistical tests examining this data may not be reliable. This paper analyzes groups that have at least five observations for each of the three variables of interest. Therefore, the paper inspects the crowding out

² IP¹, p = .5326; minWTA², p = .7268; minWTA³, p = .8421
³ Additional summary statistics separated by major and GPA can be found in Tables 4 and 5 in the Appendix.
effect in relation to social science majors, natural science majors, and subjects with GPAs between 3.5 and 4.0.

Analysis of the Crowding Out Effect

The equation described in the experimental design section is examined to determine whether crowding out occurs in this data. The experimenter uses the medians of IP^1, minWTA^2, and minWTA^3 to analyze this equation. Using these values, the left side of the equation, minWTA^2 - IP^1, is equal to $0.00. Additionally, the right side of the equation, minWTA^3, is equal to $1.75. A Wilcoxon signed rank sum test comparing the medians determines that the right side is statistically significantly larger than the left side (p = 0.0000). This result reveals that crowding out does occur in this experiment. As described earlier, the size of the crowding out effect can be measured by subtracting the left side of the equation from the right side of the equation. The results of this subtraction conclude that the crowding out effect is equal to $1.75. This finding reveals that altruistic motivation is expected to reduce minimum willingness to accept by $4.75, however, this value only decreases by $3.00. The results assert that 36.84 percent of the influence of altruistic motivation is crowded out.

The crowding out equation is also analyzed with respect to three interesting demographic groups: social science majors, natural science majors, and students with GPAs ranging from 3.5 to 4.0. In the data for social science majors, the left side of the equation is equal to negative $0.50 and minWTA^3 is equal $1.75. Again, a Wilcoxon signed rank sum test determines that the right side is statistically significantly larger than the left side (p = 0.0006), confirming that crowding out does occur. The findings for the group of subjects with GPAs that range from 3.5 to 4.0 also support the presence of
crowding out. In this equation, the left side is equal to $0.00, while the right side is equal to $2.00, and the two values are statistically significantly different from each other (p = .0004). This result exposes a crowding out effect equal to $2.00 for students within this GPA range; subjects will only perform the boring task in Treatment Three if they are compensated with at least $2.00 more than the minimum willingness to accept that is expected if there is no crowding out. This analysis reveals that crowding out occurs for social science majors and students with GPAs that range from 3.5 to 4.0.

The results for the natural science majors support a different conclusion. Using this data, both sides of the equation are equal to $0.75. A Wilcoxon signed rank sum test further confirms that these values are not statistically significantly different than each other (p = .4386). This finding suggests that crowding out does not occur for the natural science majors, as minimum willingness to accept decreases by the exact amount that is expected if the two types of motivation work together.

**V. Discussion and Conclusion**

The results of this experiment are important in furthering the understanding of motivation crowding theory. Since this design varies from the standard methodology used in previous research, the experiment is able to identify the magnitude of the crowding out effect more precisely than past studies. Through an analysis of subjects’ indifference points and decisions under different payment schemes, the experimenter is able to assert that crowding out does occur in this experiment and that the magnitude of the effect is equal to $1.75. When altruistic and financial motivations are both present, subjects’ minimum willingness to accept decreases by $1.75 less than it would if there was no
crowding out. In other words, if the financial reward did not crowd out any altruistic motivation, subjects’ minimum willingness to accept would decrease by an additional $1.75. Instead, however, the financial incentive removes, or crowds out, some of the power of the altruistic motivation. Due to this crowding out, subjects are not as motivated to decrease their minimum willingness to accept, and they require more money to complete the boring task. The amount of crowding out is equal to 36.84 percent of the total expected impact of altruistic motivation. Analyzing sub-groups of the sample, the experimenter finds that the crowding out effect occurs for social science majors and students with GPAs ranging from 3.5 to 4.0 and that the magnitude of these effects is similar to the magnitude in the whole sample. Natural science majors, however, do not experience any crowding out effects.

Future research on motivation crowding theory should address the menu effects that may have influenced this experiment’s results. Treatment Three does not offer subjects the option to complete the task and donate $5.00 to the Red Cross for less than $0.00 of personal payment. In this treatment, however, eight subjects choose to complete the task for all levels of personal payment, including $0.00. These subjects’ indifference points could be measured more accurately if they did not choose the right column for every possible payment. Additionally, if the left side of the crowding out equation was equal to a negative number, the experiment would be biased towards finding crowding out; the right side of the equation would always be larger than the left side because the smallest possible value that the right side can equal is $0.00. Since the left side of the equation is equal to $0.00 and not a negative number in the main analysis, this issue does not occur. These effects could influence the analysis of social science majors, however,
because the left side of the equation is equal to negative $0.50. This negative value makes it difficult to determine the size of the crowding out effect for this group. While the equation asserts that minimum willingness to accept should decrease to negative $0.50 in Treatment Three if there is no crowding out, this value is not one of the subjects’ options. This paper’s findings could be validated if a future experiment is designed in which subjects’ preferences cause their indifference points to be further away from $0.00.

Future research should also collect more data to increase knowledge concerning the size of the crowding out effect for different demographic groups. Since this experiment does not have a large number of observations for many groups, it is difficult to arrive at conclusions concerning these differences. It is interesting, however, that the crowding out effect does not occur for natural science majors, but does occur for social science majors. Differentiating subjects in this manner could lead to interesting findings in future research. Additionally, crowding out occurs for subjects with GPAs within the range from 3.5 to 4.0, but there are not enough observations to examine subjects within other GPA ranges. Future research should analyze whether crowding out occurs for all sub-groups of a sample, and whether the effect is equal in magnitude for all types of subjects.

The results of this experiment are important in informing the use of extrinsic incentives. When utilizing these incentives, policymakers must recognize the positive and negative aspects of their influence. The data from this experiment reveals that subjects are more motivated when both financial and altruistic incentives are present. Nevertheless, these two types of motivation do not completely work together, as financial rewards crowd out part of the altruistic motivation. In the real world, providing financial rewards
for altruism will likely increase levels of pro-social behavior; however, some of the altruistic motivation that was previously inspiring these individuals will be crowded out. The results of this experiment assert that 36.84 percent of the impact of altruistic motivation will be removed. Therefore, policymakers must ensure that the positive impact of the extrinsic incentive is large enough to overcome this reduction in intrinsic motivation. This experiment furthers the understanding of motivation crowding theory, offering a design that can precisely measure the crowding out effect and presenting results that have clear real world applications.
## Appendix

Table 4: Additional Summary Statistics Separated by Major

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistic</th>
<th>Social Science</th>
<th>Humanities</th>
<th>Natural Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of Obs.</td>
<td>10</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>IP¹</td>
<td>Mean</td>
<td>4.5</td>
<td>3.75</td>
<td>3.625</td>
</tr>
<tr>
<td>IP¹</td>
<td>Median</td>
<td>4.75</td>
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<td>4.25</td>
</tr>
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<td>IP¹</td>
<td>Std. Dev.</td>
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<td>IP¹</td>
<td>Min</td>
<td>0.25</td>
<td>3.75</td>
<td>0.25</td>
</tr>
<tr>
<td>IP¹</td>
<td>Max</td>
<td>6.75</td>
<td>3.75</td>
<td>6.75</td>
</tr>
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<td>minWTA²</td>
<td># of Obs.</td>
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<td>3</td>
<td>8</td>
</tr>
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<td>Mean</td>
<td>3.916668</td>
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<td>Median</td>
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<td>5</td>
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<td>0.25</td>
<td>4.75</td>
</tr>
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<td>minWTA²</td>
<td>Max</td>
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<td>2.75</td>
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<td>minWTA³</td>
<td>Max</td>
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<td>5.25</td>
<td>4.75</td>
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</table>
Table 5: Additional Summary Statistics Separated by GPA

<table>
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<tr>
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<th>2.9 - 2.5</th>
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<tbody>
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<td>1.25</td>
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<tr>
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<td>Min</td>
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<td>1.25</td>
<td>N/A</td>
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<tr>
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<td>Max</td>
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<td>1.25</td>
<td>N/A</td>
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<td>0</td>
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</tr>
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<td>Mean</td>
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<td>N/A</td>
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<td>Median</td>
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<td>Min</td>
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<tr>
<td></td>
<td>Max</td>
<td>9.75</td>
<td>4.75</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
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<td># of Obs.</td>
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<td>0</td>
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<tr>
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<td>Mean</td>
<td>2.277778</td>
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<tr>
<td></td>
<td>Median</td>
<td>2</td>
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<td>N/A</td>
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<td>N/A</td>
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<td></td>
<td>Max</td>
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<td>8.75</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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References


Internal, External, and Dual Enforcement to Enhance Cooperation Among Users of Natural Resources: Evidence from the Field by Lopez Perez, Maria Claudia, Ph.D., University of Massachusetts Amherst, 2008, 121 pages; UMI 3315527.


The Impact of Financial Incentives on Academic Achievement and Household Behavior: Evidence from a Randomized Trial in Nepal by Sharma, Dhiraj, Ph.D., The Ohio State University, 2011, 105 pages.


