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Money Illusion in Charitable Giving in the Absence of Market Price Resistance

Jorge N. Zumaeta
Florida International University, USA
jzumaeta@fiu.edu

Abstract: Money illusion occurs when individuals fail to differentiate nominal from real values when making financial and economic decisions. As a consequence, they do not adjust their consumption behavior according to real variables. We report an economic experiment to study whether money illusion appears in a very simple setting. It is very important to mention that the experiment was conducted in the context of charitable giving. Our experimental results showed the absence of money illusion among the participants. Our study suggests that money illusion is not present in the absence of price stickiness (market price resistance). This finding supports Shafir et al. (1997). The main objective of our study is to develop a better understanding of economic agents' charitable giving behaviors as influenced by perceptions of nominal income. Charitable institutions could build fundraising strategies based on behavioral tendencies to the perception of income in nominal or real terms.

Keywords: *Experimental Economics, Economic Attitudes, Financial Decisions, Money Illusion, Game Theory.*

1. Introduction

Whether or not money illusion exists on the part of an economic decision-maker is important for economic analysis. For example, while the Keynesian perspective asserts the existence of money illusion and is supported by empirical studies (Orland & Roos, 2013), Monetarists argued that people were fully rational beings (Lane, 2001; Stockhammer, 2008) accounting for fluctuations in the nominal value of goods and services due to inflation, (even though money illusion is instrumental to Milton Friedman's version of the Phillips curve, as cited in Nelson & Schwartz, 2008). If money illusion existed, people would have the tendency not to account for changes in the nominal values of goods and services (Eisenhuth, 2017). Shafir et al. (1997) showed that money illusion contributes to price stickiness because nominal prices adjust slower compared to real prices. The Keynesian school argues that money illusion and price stickiness cause a misalignment between nominal prices and real prices (Argitis, 2013). This misalignment causes inflation and allows for the inverse relationship between the inflation rate and the unemployment rate to exist. Kooreman, Faber, and Hofman (2004) identified the presence of money illusion in donations to charities during the introduction of the Euro. They exploited the exogenous replacement of the Guilder by the Euro in the Netherlands. Kooreman et al. compared the revenues of a house-to-house collection for a charity before and after the introduction of the euro collected during 1999, 2000, and 2001 in Guilders to the revenues collected during 2002 and 2003 in Euros.

Kooreman et al. assumed that if there was not a strong presence of money illusion, revenues collected before and after the introduction of the Euro should be about the same in real terms. Kooreman et al. found strong evidence of money illusion, which supported the Keynesian perspective and supplemented the earlier econometric, experimental, and survey evidence. Researchers argued that if a person was subject to money illusion in decision-making, the market might correct such suboptimal behavior after some experience (Fehr & Tyran, 2007). This is possible in some environments. Researchers assumed that where people engaged in speculation on prices and sought to maximize arbitrage opportunities, they might be immune from money illusion. Nevertheless, empirical evidence showed that nominal variables could influence real activity (Cohen, Polk, & Vuolteenaho, 2005) in the economy, particularly showing that the three largest stock markets trade at a higher premium when inflation is low compared to when it is high. This aspect aligned with Modigliani and Cohn (1979), who indicated that stock prices showed discounting of future cash flows in nominal terms, rather than with real discount rates. Another concept to take into account is the numerosity effect, which describes how numerical denominations can influence the decision-making process of an individual (see Amado et al., 2007; Gamble, Gärling, Charlton, & Ranyard, 2002; Raghubir & Srivastava, 2002). The introduction of the Euro in 2002 translated into a nominal shock at all levels in the economy. Kooreman et al. (2004) and Cannon and Cipriani (2006) showed ways in which donations to charities experienced an increase during the first years when the Euro was introduced.

British economist A.W. Phillips discovered the Phillips Curve (as cited in Forder, 2015). Phillips studied the annual wage inflation and seasonally adjusted unemployment rates in the United Kingdom from 1860 to 1957 (Blanchard, 2016). His analysis showed an inverse relationship between wage inflation and unemployment. Worldwide, many other economists conducted the same analysis and arrived at similar curves, showing the inverse and stable relationship between these two variables.

2. Experimental Design, Subject Pool, and Background Data and Donations

The experiment followed a simple structure and was designed to identify whether individuals made decisions regarding nominal rather than real variables. There are two treatments. Both are equivalent in terms of real variables but differ in terms of nominal variables. Please refer to Appendix B for the procedures adhered to in converting nominal terms to real variables. The experiment was conducted using 81 subjects over eight sessions, approximately 10 subjects for each session. The sessions took place in March and April 2017. They were conducted at the School of Business – the Behavioral Laboratory University of Alberta, in Edmonton, Canada in the spring of 2017. The duration of the study was approximately 30 minutes for each group and participants were compensated for their participation. All participants were volunteers from the University of Alberta's student body. There were two treatments. In the first treatment, called Low Denomination, each individual was endowed with 120 tokens. Tokens were convertible to Canadian dollars at a conversion rate of 8.5 tokens per dollar. In the second treatment, called High Denomination, the endowment was 12,000 tokens, and the conversion rate was 850 tokens per dollar. Participants were required to make a decision on whether to donate part or the entire endowment to a charity. The same request applied to both groups, and the same charities were listed in the form the participants completed.

Those charities included (a) Canadian Red Cross, (b) Habitat for Humanity Canada, (c) Canadian Cancer Society, (d) SickKids Foundation, (e) Animal Rescue Network, and (f) others. Under option (f), participants could write in another charity of their preference. Therefore, depending on the ways in which participants decided to divide the nominal amount, they were compensated for up to 14 Canadian dollars (approximately $10 US dollars). It was not possible for a participant to lose money in the experiment. Some information about the treatments and the demographic characteristics of participants is given in Table 1. Forty students participated in the Low Denomination treatment, and 41 partook in High Denomination. Out of the 40 participants playing Low Denomination, 25 (62.5%) were females, and 15 (37.5%) were males. Of the total number of students playing High Denomination, 22 (54%) were females, and 19 (46%) were males. Seventy-three percent of participants in Low Denomination were majoring in economics or business, while 51% of students participating in High Denomination were majoring in economics or business. Given the standard deviation of donations (as a percentage of endowment) in our entire data, which was equal to 0.34 compared to a mean of 0.53, the likelihood of detecting an effect of ¼ standard deviation is 35%, and of detecting an effect equal to ½ of the standard deviation is 89%. These power calculations showed that the sample size was large enough to identify a substantial effect when one exists.

Table 1: Treatments and Characteristics of Participants

Treatment	Token Endowment	Conversion Rate	# of Subjects	# Females	# Economic/ Business Majors
Low Denomination	120	8.5 Tokens per Dollar	40	25	29
High Denomination	12,000	850 Tokens Per Dollar	41	22	21

We made the donations on May 31st, 2017. Donations followed the will of the participants precisely whenever possible. A total of CAD 583.02 was allocated for donations to the charities listed below. Table 2 displays the amount donated to each charity. The interaction between treatment and major is included because it may be the case that students of economics and business are less susceptible to nominal reasoning. Donations were made via the respective charities' web pages using a credit card for payment. Subjects chose a few charities that did not have a working and easily accessible website or mechanism for collecting donations. These entities included Barcelona F.C. (which was not a charity in any case) and Independent Projects for Social Empowerment (see Table 2).

Table 2: Donations Allocations by Participants (in Canadian Dollars)

	Treatment		
	Low Denomination 120/8.5	High Denomination 12000/850	Total
a. Canadian Red Cross	$54.24	$73.36	$127.59
b. Habitat for Humanity Canada	$16.47	$21.18	$37.65
c. Canadian Cancer Society	$58.82	$53.02	$111.84
d. SickKids Foundation	$52.82	$61.18	$114.00
e. Animal Rescue Network	$66.12	$57.88	$124.00
f. Others:	$18.82	$49.12	$67.94
Church Celebration Edmonton	$2.35		
Barcelona F.C.	$2.35		
Doctors without Borders	$14.12		
Plan Canada International	$14.12		
Edmonton Hispanic Bilingual Association	$14.12		
Independent Projects for Social Empowerment	$11.76		
Botswana SOS	$9.12		
Total to Other Non-Profit	$67.94		

Overall Totals $403.18 $315.73 $583.02.

3. Results and Discussion

Under the Low Denomination treatment, 15% of participants kept their entire endowment, and 20% donated all the money. The average donation in the Low Denomination treatment was 50% of the endowment. In the High Denomination treatment, 7% kept all the money, and 24% donated it all. The average for this treatment was 56%. Figures 1 and 2 illustrate the frequency distribution of donated dollars by deciles in each treatment. Both figures show some areas of concentration in the distribution of both Low Denomination and High Denomination donations. The averages showed relatively minor differences between the two groups that could not substantiate solidly the existence of money illusion. On the contrary, and in support of the monetarist perspective, the value of each monetary unit did not make a difference in participants' decisions.

Figure 1: Histogram of Donation Decisions in the Low Denomination Condition

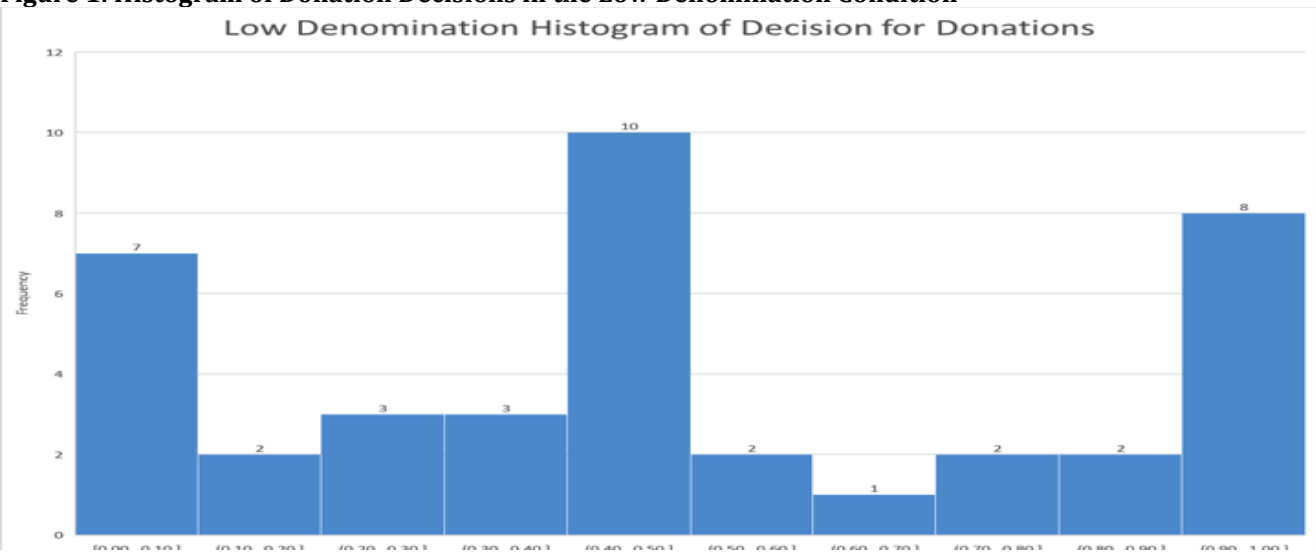

Figure 2: Histogram of Decisions in the High Denomination Condition

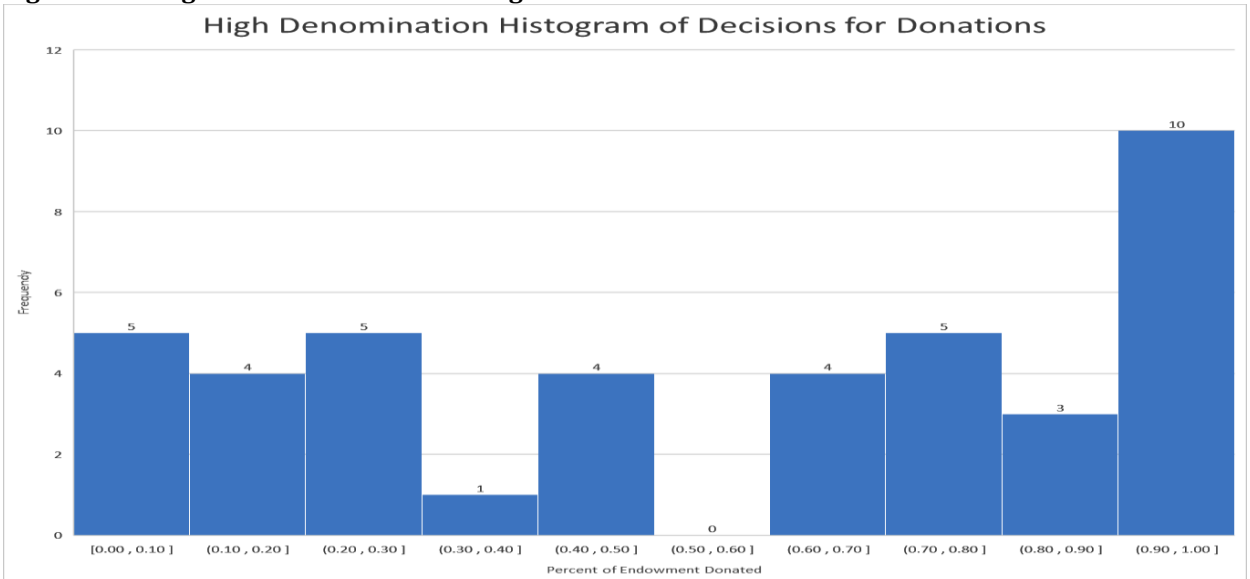

Table 3: Donation by Group and Condition

	N	Mean	Std. Deviation	Std. Error Mean
Males	34	0.56	0.37	0.06
Females	47	0.40	0.32	0.05
Low Denomination	40	0.50	0.34	0.05
High Denomination	41	0.43	0.35	0.05
Business Major	50	0.47	0.35	0.05
Non Business Major	31	0.46	0.34	0.06

Table 4: Results of t-test of Differences in Percentage Kept between Treatments, Genders, and whether Subjects were Business Majors

	T-test for Equality of Means						
						95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Gender	2.085	79	0.040(*)	0.159	0.076	0.007	0.312
Treatment	0.843	79	0.402	0.065	0.077	-0.089	0.219
Bus Major	0.014	79	0.989	0.001	0.080	-0.158	0.160

Note: (*) p<0.05; (**) p<0.01; Gender: Males=1, Females=0; Treatment: Low Denomination = 1 and High Denomination = 0; Business/Economic Majors: 1, Others: 0.

This finding is supported by *t*-tests (see Table 4). A *t*-test of the hypothesis that the difference in the average percentage of endowment donated between the two treatments showed that the differences were insignificant ($t(79) = 0.843$, $p = .402$). However, a *t*-test of the hypothesis that women and men donate the same amount on average showed a significant difference in the average percentage of endowment donated between the two genders ($t(79) = 2.085$, $p = .04$). The null hypothesis that business majors and those that were not business major others donate the same amount was not rejected since the results of the *t*-test showed an insignificant difference ($t(79) = .014$, $p = .989$) in the amount donated between these two samples. We also conducted a regression analysis, with donations as the main variable of interest, and controlling for (a) treatment, (b) gender (male/female), (c) major (economic-business/other), and (d) treatment*major.

The regression analysis is reported in Table 5. In Table 5, Column 1 shows the regression analysis of donations as a function of treatment. Column 2 shows the regression analysis when controlling for treatment and gender. Column 3 contains the estimates for a specification consisting of treatment, gender, Business major, and treatment*major. The interaction between treatment and major is included because it may be the case that students of economics and business are less susceptible to nominal reasoning. The analysis showed no statistical significance, except for gender. Table 5 presents regression estimates. Donations are the dependent variable. When controlling only for treatment, in equation (1), the regression analysis did not show any statistical significance. In other words, the data showed no indication of the existence of the money illusion effect between the two treatments. When controlling for gender in equation (2), the regression analysis showed that treatment did not have any statistically significant effect on the amount donated. The regression analysis did not show any significant presence of money illusion as treatment remains insignificant.

In specification (3), we, also controlled for gender, treatment, business/economics major, and interaction effect of treatment * business. As with the prior results, the data showed that gender was statistically significant, which remained consistent with prior studies? Overall, none of the other variables of treatment, business/economics major and interaction effect of treatment * business, showed any significance towards explaining the relationship between the dependent variable (donations) and the independent variables (treatment, business/economics major, and treatment * business/economics majors). There is a significant positive effect on females on the amount donated. A *t*-test also shows a significant difference in the average percentage of endowment donated between the two gender groups (t=2.085, p = .040). Furthermore, running the auxiliary regressions for males and females separately, as reported in Table 6, showed no effect of treatment, business/economics major, and interaction effect of treatment * business on the amount donated.

Table 5: Determinants of Donations

	(1) **Donation**	**(2)** **Donation**	**(3)** **Donation**
Gender		.167 (*) (.077)	.167 (*) (.078)
Treatment	.065 (.077)	0.080 (.076)	-.120 (.129)
Business/Economics Major			-.007 (.107)
Treatment*Business/ Economics Major			-.057 (0.107)
Constant	.568 (***) (.054)	.645(***) (.064)	.649 (***) (.084)
R^2	.009	.065	.068
Observations	81	81	81

Note: (*) p<0.05; (**) p<0.01; Gender: Males=1, Females=0; Treatment: Low Denomination = 1 and High Denomination = 0; Business/Economic Majors: 1, Others: 0; Treatment/Business: 1, Others: 0.

Table 6: Determinants of Donations – Auxiliary Regressions for Males and Females Separately

	For Males Donation	For Females Donation (2)
Treatment	.120 (225)	.096 (.155)
Business/Economics Major	-.154 (.172)	.117 (.137107)
Treatment*Business/ Economics Major	.041 (.278)	.028 (0.198)
Constant	.337 (.394)	.379 (.271)
R^2	.061	.046
Observations	33	46

Note: (*) p<0.05; (**) p<0.01; Gender: Males=1, Females=0; Treatment: Low Denomination = 1 and High Denomination = 0; Business/Economic Majors: 1, Others: 0; Treatment/Business: 1, Others: 0.

Discussion

The discussion regarding whether money illusion influences individuals' decision-making and consumer behavior remain vigorous (Nelson & Schwartz, 2008; Stockhammer, 2008). However, the effect of money illusion on consumers' decision-making and behavior is difficult to distinguish from other factors with non-experimental data due to the dynamic changes typically occurring in an individual's decision environment. The results of the experiment were straightforward and showed minimal to non-existent money illusion among the participating individuals. It might seem that the results support the Monetarist school of thought, and participants understood clearly the difference between nominal and real variables, thereby adjusting their consumption behavior accordingly (in the short run). This is consistent with Shafir et al.'s (1997) intuition that money illusion influenced consumers' behavior through price stickiness, occurring because people fail to anticipate and then to account for price changes (Maloney, 2011; Stockhammer, 2008). In this particular experiment, there were no price changes since prices were varied between-subject, and money illusion was not observed. The experiment shows that the denomination of monetary units used for decision-making does not have any effect on decisions. There was no evidence of any numerosity effect. The minor differences in decisions between the two treatments were not statistically significant. We observed that participants were attentive to requests of dividing the tokens and calculating the equivalent amount in dollars. We found several calculations on participants' scratch paper utilizing the conversion rate from tokens to dollars. In addition, there were many inquiries about ways in which the donations would be made to the agency of their choice.

Such observations support the idea that our subjects thought rationality to arrive at an informed decision (Cárdenas, De Roux, Jaramillo, & Martinez, 2014). As we stated earlier, central to the argument of the Phillips Curve is the existence of the money illusion effect, in which individuals make decisions based on nominal rather than real variables. This influences consumer behavior through wage or price stickiness, insufficient adjustment of prices and wages to the growth of the money supply. For example, if nominal wages remain the same, even though real wages fall, consumers may spend as much as before, but not realize that they actually have a less real income. The money illusion effect, though price stickiness, is one of the factors contributing to the slow adjustment of consumer behavior to real price changes in the market, as consumer behavior and demand do not adjust automatically with price fluctuations. Price inertia is also the mechanism underlying the persistence of shocks and business cycles in New Keynesian Dynamic Stochastic General Equilibrium models. In other words, the tendency of prices to remain constant, despite changes in the cost of producing and selling a product, can cause general inflationary pressure in the market. Above all, the experiment rendered clear results that did not show a significant indication of money illusion, which did not have any

impact on individuals' decision-making in terms of charity giving. There was no indication of money illusion in our one-shot task (one treatment), where there could be no role for price stickiness in generating money illusion. This suggests that a previous history of decision-making and some inertia in these decisions are the key factors leading to money illusion.

4. Conclusion and Recommendations

Our experimental results revealed the absence of money illusion among the participants. Our study showed that in an environment where price stickiness was not possible, money illusion was not observed, perhaps suggesting a relationship of causality. Such observation is congruent with the findings of Shafir et al. (1997), who argue that money illusion can only be observed when there is price stickiness. The conjecture that is suggested from this study is that money illusion arises only as a consequence of inertia in decision making when real, but not nominal variables, change. One recommendation would be to incentivize researchers to engage in multi-treatment long-term experiments to better gauge economic agents' behavioral and financial decisions over time. A one-shot task may provide a limited glimpse of the economic attitudes and financial decisions with respect to charitable giving. During our one-shot economic experiment, participants did not exhibit money illusion characteristics because there was no price stickiness; nevertheless, participants responded to the experiments based on their own prior experiences and cultural biases. A second recommendation would be for future researchers to expand on the limitations on economic agents' charitable giving behaviors as influenced by perceptions of nominal income. This information is important since one of the objectives of this analysis is to determine a way of motivating economic agents to participate actively in charitable giving. As indicated earlier, charitable institutions could build fundraising strategies based on behavioral tendencies in response to the perception of income in nominal or real terms.

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Appendix A1. Low Denomination - Instructions to Subjects

Instructions for the Experiment: Today you will participate in an economic experiment where you get to decide on how to split 120 tokens between yourself and a charity. The conversion rate is 8.5 tokens per dollar. You can keep the entire amount, donate a portion and keep the rest, or donate the entire amount. If you decide to donate a portion or the entire amount, the researcher will donate the amount to the agency/organization you have chosen or you can keep the entire amount. If you decide to keep a portion or the entire amount, the researcher will give you the money in cash at the end of this session. You can choose from 5 charities that we have indicated in options a) – e) below

Please write your decision:
Tokens to be kept: _____ Tokens to be donated: _____

Please choose by circling the agency/organization that you would like to donate to:
a) Canadian Red Cross
b) Habitat for Humanity Canada
c) Canadian Cancer Society
d) SickKids Foundation
e) Animal Rescue Network
f) Other: Please fill in the blank _____

This concludes the experiment. Thank you for your participation.

Appendix A2. High Denomination - Instructions to Subjects

Instructions for the Experiment: Today you will participate in an economic experiment where you get to decide on how to split 12000 tokens between yourself and a charity. The conversion rate of tokens to dollars is 850 tokens per dollar. You can keep the entire amount, donate a portion and keep the rest, or donate the entire amount. If you decide to donate a portion or the entire amount, the researcher will make a donation in the amount to the agency/organization you have chosen or you can keep the entire amount. If you decide to keep a portion or the entire amount, the researcher will give you the money in cash at the end of this session. You can choose from 5 charities that we have indicated in options a) – e) below

Please write your decision:
Tokens to be kept: _____ Tokens to be donated: _____

Please choose by circling the agency/organization that you would like to donate to:
a) Canadian Red Cross
b) Habitat for Humanity Canada
c) Canadian Cancer Society
d) SickKids Foundation
e) Animal Rescue Network
f) Other: Please fill in the blank _____

This concludes the experiment. Thank you for your participation.

Appendix B1: Raw Data – Low Denomination

120 Tokens - 8.5 Tokens per Dollar						
Participant	Tokens		Money			
	Kept	Donated	Kept	Donated	Gender	Major
1	0	120	$ -	$ 14	F	Arts
2	90	30	$ 11	$ 4	F	Psychology
3	20	100	$ 2	$ 12	F	Management
4	48	72	$ 6	$ 8	F	Engineer
5	30	90	$ 4	$ 11	F	Human Resources
6	120		$ 14	$ -	M	Business
7	70	50	$ 8	$ 6	F	Finance
8	51	69	$ 6	$ 8	F	Business
9	60	60	$ 7	$ 7	M	Management
10	100	20	$ 12	$ 2	F	Veterinary
11	120		$ 14	$ -	M	Business
12	40	80	$ 5	$ 9	F	Business
13	60	60	$ 7	$ 7	F	Finance
14	60	60	$ 7	$ 7	F	Business
15	80	40	$ 9	$ 5	F	Intl Business
16	90	30	$ 11	$ 4	F	Nursing
17	30	90	$ 4	$ 11	F	Finance
18	120		$ 14	$ -	F	Business
19	120		$ 14	$ -	M	Computer Science
20	80	40	$ 9	$ 5	M	Computer Science
21	120		$ 14	$ -	M	Finance
22	110	10	$ 13	$ 1	F	Natural Sciences
23	80	40	$ 9	$ 5	F	Marketing
24	60	60	$ 7	$ 7	M	Business
25	0	120	$ -	$ 14	F	Business
26	60	60	$ 7	$ 7	M	Business
27	60	60	$ 7	$ 7	F	Business
28	60	60	$ 7	$ 7	M	Management
29	103	17	$ 12	$ 2	F	Operations Management
30	0	120	$ -	$ 14	M	Business
31	120	0	$ 14	$ -	M	Business
32	0	120	$ -	$ 14	F	Business
33	0	120	$ -	$ 14	F	Business
34	12	108	$ 1	$ 13	F	Business
35	60	60	$ 7	$ 7	M	Economics
36	0	120	$ -	$ 14	F	Biology
37	0	120	$ -	$ 14	F	Business
38	84	36	$ 10	$ 4	M	Economics
39	60	60	$ 7	$ 7	M	Arts
40	0	120	$ -	$ 14	M	Physics

Appendix B2: Raw Data – High Denomination

12,000 Tokens - 8,500 Tokens per Dollar						
Participant	Tokens		Money			
	Kept	Donated	Kept	Donated	Gender	Major
1	4,000	8,000	$ 5	$ 9	F	Education
2	12,000	-	$ 14	$ -	M	Education
3	4,000	8,000	$ 5	$ 9	F	Nutrition
4	6,000	6,000	$ 7	$ 7	F	Public Administration
5	6,000	6,000	$ 7	$ 7	F	Hospitality
6	12000	-	$ 14	$ -	M	Business
7	3500	8,500	$ 4	$ 10	F	Business
8	2550	9,450	$ 3	$ 11	M	Computer Science
9	10285	1,715	$ 12	$ 2	F	Business
10	11150	850	$ 13	$ 1	M	Business
11	4248	7,752	$ 5	$ 9	F	Business
12	3500	8,500	$ 4	$ 10	F	Chemistry
13	8500	3,500	$ 10	$ 4	F	Occupational Therapy
14	6000	6,000	$ 7	$ 7	F	Nursing
15		12,000	$ -	$ 14	F	Graphic Design
16	8500	3,500	$ 10	$ 4	M	Business
17	6000	6,000	$ 7	$ 7	M	Engineering
18	11000	1,000	$ 13	$ 1	M	Arts
19		12,000	$ -	$ 14	F	Business
20	8500	3,500	$ 10	$ 4	M	Science
21	10200	1,800	$ 12	$ 2	F	Economics
22	8500	3,500	$ 10	$ 4	F	Bio-Chemistry
23	8500	3,500	$ 10	$ 4	M	International Business
24	10,300	1,700	$ 12	$ 2	M	Finance
25	10000	2,000	$ 12	$ 2	F	Biology
26	7750	4,250	$ 9	$ 5	F	Marketing
27		12,000	$ -	$ 14	M	Management
28	3400	8,600	$ 4	$ 10	M	Physics
29	0	12,000	$ -	$ 14	F	Business
30	2000	10,000	$ 2	$ 12	F	Business
31	12000	-	$ 14	$ -	M	Business
32	0	12,000	$ -	$ 14	F	Business
33	0	12,000	$ -	$ 14	F	Business
34	0	12,000	$ -	$ 14	M	Modern Languages
35	2000	10,000	$ 2	$ 12	M	Physics
36	0	12,000	$ -	$ 14	F	Engineering
37	4,250	7,750	$ 5	$ 9	M	Economics
38	0	12,000	$ -	$ 14	M	MBA
39	2000	10,000	$ 2	$ 12	M	Business
40	3000	9,000	$ 4	$ 11	F	Business
41	0	12,000	$ -	$ 14	M	Arts