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# The lab versus the virtual lab and virtual field—An experimental investigation of trust games with communication

Marina Fiedler[a,1], Ernan Haruvy[b,*]

[a] Institute for Information, Organization and Management, Ludwig-Maximilians-Universität München, Ludwigstraße 28 VG II/Zi. 203, Munich, 80539 Germany

[b] School of Management, SM 32, University of Texas at Dallas, 800 West Campbell Rd., Richardson, TX 75083-0688, United States

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ABSTRACT

We study trust games in a virtual world environment and contrast results with laboratory studies, with and without personal interaction enabled by the virtual world platform. Particular attention is given to the motives that drive behavior in the various environments and to issues that are context dependent, particularly communication and social distance. We find that allowing for personal interaction through a virtual world interface increases the amount sent relative to laboratory results, but that subjects recruited in the virtual world give and return less than the laboratory control group with the same virtual world interface.



## 1. Introduction

Academic debates on the merits of the laboratory versus the field have contrasted the relatively greater control in the lab with the better realism and context of the field (e.g., Harrison and List, 2004; Levitt and List, 2007a,b, 2009). The emergence of the virtual world as an environment where tens of thousands of residents interact provides a possible compromise in that it gives the researcher reasonable control while allowing for interaction in an environment familiar to virtual world residents (Bainbridge, 2007; Bloomfield, 2007; Castronova, 2001). In particular, it might be useful to replicate known experiments in a virtual environment (e.g., Chesney et al., 2007; Spann et al., 2008) while taking advantage of environmental features not previously available in laboratory experiments (Bainbridge, 2007). A particularly important feature of virtual worlds in our view is the ability to have virtual face-to-face communication without compromising real-world anonymity.

We study trust games in such an environment and contrast results with lab studies, with and without the virtual world platform. Particular attention is given to issues that are context dependent: communication, both personal and impersonal,

* Corresponding author. Tel.: +1 972 883 4865; fax: +1 972 883 6727.
*E-mail address:* eharuvy@utdallas.edu (E. Haruvy).
[1] Tel.: +49 89 2180 2777; fax: +49 89 2180 99 2777.

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and social distance as measured by group orientation and perceptions. We find that allowing for personal interaction through the use of a virtual world interface increases both the amount sent and the percentage returned relative to a faceless lab study. We further find that subjects recruited in the virtual world give and return less than subjects sitting in the lab and interacting through the virtual world interface. Particular attention is given to the motives that drive such behavior—including trust, reciprocity, cooperation, and utilitarian motives.

A persistent state virtual world is a computer-mediated environment which simulates the real-world, in which human participants interact, but which continues to exist independent of the human players (Bloomfield, 2007). In this work, we use a virtual world known as *Second Life* for our experiments. Second Life is not the largest virtual world. To date, *World of Warcraft* is the largest virtual world (for a nice dictator game study in World of Warcraft, see Spann et al., 2008). Second Life may be better suited for some types of research (Bainbridge, 2007; Bloomfield and Rennekamp, 2008). According to Bainbridge (2007), Second Life is especially ideal for experiments in social and cognitive sciences, because the researcher can construct a facility comparable to a real-world laboratory and recruit research subjects. Bloomfield (2007) argues that Second Life is ideal for research due to its rich economy, naturally evolving markets, and active commerce. The first economic study of virtual world economies and markets is by Castronova (2001), involving the virtual world of Norrath. At the time, Norrath was the most market-oriented virtual environment. Today, Second Life is the most widely covered virtual world in the business press, with numerous S&P500 companies, including IBM, Sun, and Nike establishing presence online. Other examples of business applications in virtual worlds are hotels that allow their customers and business partners to walk through the virtual hotel, thus providing useful and inexpensive feedback, clothing companies that enable customers to try out clothes and furniture based on their avatar's specifications, as well as intercultural sensitivity simulations (Piller and Salvador, 2007).

Over 150 educational institutions own land, hold events or collaborate in Second Life. Companies and universities use it to test concepts and designs, conduct work meetings, seminars, lectures, recruiting, advertising and any kind of collaborative activity. It has a functioning and active stock exchange and numerous businesses that sell virtual and real products and services to residents. Second Life users come from all walks of life and are there for various reasons, including socializing and role play. Many of the residents spend a sizable portion of their time in the virtual world, own or rent virtual real estate and many have virtual jobs.

According to Linden Lab (2008), of the 500,000 active users 41 percent are female and 59 percent are male. Active users reside in over 100 different countries with approximately 60 percent from the United States, United Kingdom, Germany, Japan and France, combined. The largest age group (34 percent) of active users is in the 25–34 years old range, but 20 percent of all in-world hours are spent by the people over 45 years old. Thus Second Life offers a participant pool with a wider range of demographic characteristics as well as more experience with virtual face-to-face communication than the average college student subject pool.

Virtual worlds are ideally suited to the study of communication and social distance since individuals can communicate and conduct interpersonal exchanges in an interactive communication environment. It is possible to create a wide range of verbal and nonverbal interpersonal messages which offer more possibilities for sending social cues than other electronic communication without compromising anonymity (Biocca, 1996). There is virtually no academic research on the effects of avatar-based communication on strategic behavior in games or comparing lab participants and virtual world residents. The purpose of the present work is thus to investigate the effects of avatar-based strategically irrelevant cheap-talk communication on behavior in the trust game, taking into account the influence of social distance and different subject pools.

Cheap talk has been shown important for economic behavior—particularly in increasing the incidence of cooperative outcomes (Charness and Dufwenberg, 2006). Few studies look at the impact of strategically irrelevant communication on behavior in games and the findings are mixed. Dawes et al. (1977) find hardly any effect, but Roth (1995), in bargaining games, Buchan et al. (2006) and Fiedler (2009), in trust games, find that strategically irrelevant cheap talk has a positive effect on cooperation.

A related line of research concerns anonymity and social distance. Charness and Gneezy (2008) show that anonymity can increase selfishness, whereas Dufwenberg and Muren (2006) suggest that anonymity may at times reduce selfishness. The main effect of anonymity, according to both of these works, is to increase social distance, which in turn impacts behavior and preferences towards others. With avatar-based interaction, real-world anonymity is maintained in that participants do not know the real-world identities of those they interact with. Moreover, with participants recruited in the virtual world, they are likely to be from geographically distant locations, hence farther increasing social distance (Charness et al., 2007).

In the present study, participants communicate face-to-face, where the faces are virtual. To the extent that virtual faces matter, social distance may be reduced. Face-to-face interaction seems to be important to collaborative interpersonal relationships (Jarvenpaa and Leidner, 1999; Nardi and Whittaker, 2002; Nohria and Eccles, 1992; O'Hara-Devereaux and Johansen, 1994). Although computer-mediated communication leads to higher cooperation levels than no communication, it usually produces weaker cooperation than that of face-to-face communication (Bochet et al., 2006; Brosig et al., 2003; Duffy and Feltovich, 2002; Frohlich and Oppenheimer, 1998; Jensen et al., 2000). Other works have argued that computer-mediated communication may help individuals to communicate more clearly than face-to-face communication since the interference of many stigmatized features can be reduced (Sheeks and Birchmeier, 2007). The concept of computer-mediated face-to-face interaction via a virtual world may provide a hybrid that allows for features from both environments.

The present investigation is an important first step to assess both subject pool and platform effects of virtual face-to-face communication on strategic behavior.

## 2. Experimental design

### 2.1. The game

In the trust game, a first mover—the *proposer* – sends an amount from his initial endowment to a second mover—the *responder*. Any amount not sent to the responder is kept by the proposer. The amount sent to the responder is multiplied by 3 and the responder then chooses an amount to send back to the proposer. Half of the participants were designated as proposers and the other half as responders, to be later matched in pairs. Both proposers and responders received equal initial endowments. The initial endowments are 10 Lab-Euros (4 Lab-Euros = 1 Euro) in the laboratory and 1000 Linden Dollars in Second Life (374 Linden Dollars = 1 Euro).

### 2.2. Pre-play communication

Prior to playing the trust game, participants first engaged in 15 min of pre-play irrelevant communication in groups of three to four participants. All communication took place in a Second Life room using avatars and text chat. University-recruited subjects were provided with avatars, whereas Second-Life recruited subjects brought their own avatars to the experiment. The communication process was intended to generate personal interaction of the kind one might experience in a virtual community, while maintaining some control over the topics of discussion. To examine whether the topics of discussion influence behavior, we allowed for two sets of topics—personal and impersonal (see Buchan et al., 2006). Personal topic discussion groups were told to introduce themselves, talk about their favorite birthday as a child and describe their ideal holiday, among other topics. Impersonal topic discussion groups were told to discuss topics concerning general knowledge about the world: to name the most populated cities of the world, the highest mountains, or countries that have the highest cost of living according to the United Nations. While these topics are framed as impersonal questions, the answers to these questions were discussed by the group in a collaborative environment, where group members inevitably disclosed information about themselves, although this was monitored and controlled to some extent. During the entire communication process, the discussions were observed by monitor avatars. Monitors were tasked with ensuring that only the assigned topics were discussed. The specific questions for the personal and impersonal treatments are given in Appendix A.

### 2.3. Matching

Following the pre-play communication, participants were matched for the trust game in proposer–responder pairs. Matching was anonymous (double-blind) but participants were told whether they were matched with a member of their own communication group (ingroup) or another communication group (outgroup). The actual matching between proposers and responders as well as ingroup and outgroup allocation was done via Java Script in combination with PHP Hypertext Preprocessor protocol.

### 2.4. Interface

To control for experimenter effects as well as to avoid collusion between the participants, the trust game in Second Life was played via a web browser. The link to the web was implemented via Linden Scripting Language (LSL), which allows for self-developed programs within objects in Second Life and more specifically interoperability between Second Life and the World Wide Web. By clicking on a link in Second Life, a web browser opened displaying the web page for the experiment. The web page explained the rules of the trust game and indicated to subjects whether they were in the role of proposer or responder, and whether they were to be matched with a partner in their own communication group (ingroup) or from another communication group (outgroup). Neither the participants nor the experimenter knew with whom they were matched and all investment decisions were done in private. All data – communication treatment, ingroup or outgroup allocation, amount sent and returned as well as all the questionnaire data – were saved in a SQL database. After the trust game was over, the amount each participant earned was computed and paid to the participant instantly in Linden Dollars.

### 2.5. University-recruited subjects

A total of 176 university-recruited participants took part in the experiment. All 176 participants played the trust game with no knowledge of the real-world identities of the people they interacted with. All the participants were students from the Ludwig-Maximilians-University of Munich. University participants were recruited via website posts, class announcements, and posters and leaflets in the different faculties—specifically psychology, informatics, communication science, medicine, and law. Of 176 participants, 40 participants played the trust game without prior communication. This is condition 1, which we call the *No-Communication in the Lab* condition. The remaining 136 participants were assigned to communication sessions in the virtual world of Second Life prior to playing the trust game. This is condition 2, which we call the *Virtual Pre-play*

*Communication in the Lab* condition. The 136 participants in condition 2 were organized randomly into 45 small discussion groups: 44 groups of three participants and 1 group of four participants.

### 2.6. Second life subjects

Condition 3 is the *Virtual Pre-play Communication by Second Life Residents* condition. It involves 216 Second Life residents recruited via posts in several Second Life forums, blogs, ads and group notices. Individuals sent an email or an in-world instant message indicating that they were interested in participating. Participants were informed that no critical real-world information had to be revealed and that it would take approximately 35 min to complete the experiment. Participants were then scheduled for communication sessions each hour between 9am and 3pm (Pacific Standard Time) since this seemed to be the time that was most convenient for the majority of the participants from Australia/New Zealand, Europe and North America. Participants were asked to be logged into the virtual world 5 min prior to the assigned time slot to avoid delay. They then received an invitation either via teleport or a landmark that teleported them directly into the assigned communication group. After participants arrived they were asked to take a seat and remain silent until the official start of the experiment. Communication groups were usually filled within 5 min. When possible, two communication groups were scheduled for the same time slot. Once everyone arrived and took a seat, a standard procedure was employed where the monitor avatar asked the participants to open their communication history and to state whether they knew anyone in the room. If so, participants were rescheduled. Every participant (represented by an avatar) was only allowed to participate once. Participants were told they would communicate for 15 min on the assigned topics and then asked to make a decision as well as to fill out a questionnaire. Participants were asked to text chat for the next 15 min about topics posted on the walls of the room where the communication took place. After indicating that they understood the instructions they communicated for 15 min.

Following the completion of the communication session, participants were told to click on a positioned script on the table in front of them that led them to the trust game interface. After finishing the trust game as well as answering the questionnaire participants sent an instant message to us indicating that they are done. They then received their earnings in Linden Dollars (which can be instantly converted to Dollars) via Second Life pay.

The 216 participants in the *Virtual Pre-play Communication by Second Life Residents* condition were organized randomly into 72 small discussion groups: one group of two participants, 70 groups of three participants and one group of four participants.

The demographic composition of the Second Life population is older on average than the university-recruited subjects and the nationality of participants in Second Life is more heterogeneous. A summary of basic demographic information is shown below (Table 1):

## 3. Results

### 3.1. Actions

The dependent variables in our analysis are the amount sent by the proposer to the responder and the proportion returned by the responder. We compute the proportion returned as the amount responders returned divided by their total wealth—three times the amount sent plus the initial endowment.

The first aspect to note is that the patterns of behavior of university-recruited subjects (conditions 1 and 2) are similar to known results. Our No-Communication in the Lab condition (condition 1) resulted in proportion sent of 50.5 percent (std. dev. 29.6 percent) and proportion returned of 34.7 percent (std. dev. 20.0 percent). In comparison, in the seminal trust game of Berg et al. (1995), the average sent is 53.6 percent (59.7 percent in Cox) and the average returned is 35 percent of the amount received. These results have been replicated numerous times with a surprisingly tight range around these proportions (see Camerer, 2003 for an overview of replication studies, including cultural differences).

University-recruited subjects in the Virtual Pre-play Communication in the Lab condition (condition 2) sent 74.5 percent (std. dev. 27.5 percent) and returned 38.2 percent (std. dev. 22.0 percent). The amount sent is significantly more than the university subjects in the No-Communication in the Lab condition (condition 1), which sent 50.5 percent, with a $p$-value of 0.001. The proportion returned by university-recruited subjects in the Virtual Pre-play Communication in the Lab condition (condition 2) is higher than the No-Communication in the Lab condition (condition 1) but not significantly so, with a $p$-value of 0.52.

Second Life resident proposers in the Virtual Pre-play Communication by Second Life Residents condition (condition 3) send 59 percent (std. dev. 34.9 percent). This is significantly ($p$-value of 0.003) less than university-recruited subjects in the Virtual Pre-play Communication in the Lab condition, where giving is 74.5 percent. Second Life resident responders in

**Table 1**
Basic demographic composition.

| | Gender | Age: mean (std. dev.), range | Country in which they were at the time |
|---|---|---|---|
| Second Life participants | 40% males | 33 (11), 16–70 | USA: 84Europe: 99Other: 15Unknown: 18 |
| University-recruited participants | 41% males | 24 (5), 18–57 | Germany: all |

**Table 2**
Subject choices in the trust game.

| | N | Proportion sent | Proportion returned |
|---|---|---|---|
| Condition 1. University-recruited participants without pre-play communication | 40 | 50.5 (29.6) | 34.7 (20.0) |
| Condition 2. University-recruited participants with Second Life interface for pre-play communication | 136 | 74.5 (27.5) | 38.2 (22.1) |
| Condition 3. Second Life residents with Second Life pre-play communication | 216 | 59.5 (34.9) | 29.1 (28.6) |

**Table 3**
Proposer and responder regressions. Proportions sent and returned are the dependent variables and treatment and personal characteristics are the independent variables. Standard errors are in parentheses.

| | Dependent variable: proportion sent by proposer | Dependent variable: proportion returned by responder |
|---|---|---|
| Intercept | 30.826[a] (11.618) | 5.694 (7.744) |
| Personal communication | 5.823 (4.985) | 2.308 (3.916) |
| Ingroup partner | 0.272 (4.911) | 8.041[a] (3.952) |
| Male | 6.659 (4.985) | 1.938 (4.069) |
| Age | 0.694[a] (0.307) | 0.547[a] (0.207) |
| University-recruited | 21.682[a] (5.668) | 12.472[a] (4.418) |

[a] Significant at 5% level.

condition 3 return 29.1 percent (std. dev. 28.6 percent). This is significantly ($p$-value of 0.028) less than university-recruited subjects interacting in the Virtual Pre-play Communication in the Lab condition, where the proportion returned is 38.2 percent (Table 2).

In the regression reported in the second column of Table 3, money sent by the proposer is the dependent variable and the treatments and demographics are explanatory variables. The results indicate that university-recruited subjects are different from Second Life resident subjects, controlling for gender age and treatment variations, and send a greater proportion of their endowment to the responder. Note that motives are not included as explanatory variables. This is because motives are presumably determined by the other explanatory variables, resulting in endogeneity. We will revisit motives shortly.

The third column in Table 3 has the proportion returned as the dependent variable and treatment variables as well as demographics as the explanatory variables. It shows that the subject pool differences are large, controlling for gender and age, and that university subjects return a significantly higher proportion than Second Life resident subjects.

The regression also indicates that ingroup affiliation makes a significant and positive difference in the proportion returned by the responders.

### 3.2. Motives

We established that university-recruited subjects interacting via the virtual world interface appear to send and return more than Second Life residents. However, there are several motives that could account for the observed behavior. We report some averages on a number of other-regarding motives that have been proposed in the literature as explanations for observed behavior in the trust game.

The first motive we examine is a cooperative sentiment, which could be viewed as a proxy for altruism. Subjects were asked to indicate how cooperative they felt towards their partners. The second motive is trust in one's partner. This motive was broken down by ingroup and outgroup partners. The third motive is feeling of obligation towards one's partner. Lastly, the utilitarian motive was the subject's indicated importance for maximizing joint earnings.

For lab proposers, ingroup trust (4.07) was significantly higher than outgroup trust (2.88) ($p$-value < 0.001) in a matched pair t-test. For Second Life resident proposers, ingroup trust (4.44) was significantly higher than outgroup trust (3.08), with a $p$-value of $p < 0.001$. This despite the fact that money sent is not significantly different for those matched with ingroup members and those matched with outgroup members.

The $p$-value for matched comparison of ingroup and outgroup trust for lab responders is less than 0.001. For Second Life resident responders as well ingroup trust is significantly higher than outgroup trust at $p < 0.001$ (matched pair t-test). This is consistent with the finding that responder's proportion returned is significantly higher for ingroup members.

Second Life resident responders exhibit significantly more ingroup trust ($p$-value = 0.004) and more outgroup trust ($p$-value = 0.070) than Responders in the Virtual Pre-play Communication in the Lab condition. No other motives in Table 4 exhibit significant difference though both Second Life resident proposers and Second Life resident responders give higher trust scores than lab subjects. The differences between university-recruited and Second Life resident subjects on cooperative, utilitarian and obligation sentiments are small and not consistent between roles or motives, suggesting that there is likely not much difference there.

We next estimate, in Table 5, the impact of the various motives on proposer and responder choices in the trust game. The amount sent by proposers, in both the lab and the field, is increasing in cooperative and utilitarian motives, but not in trust. As discussed earlier, the first two motives do not appear different in lab subjects relative to the field subjects. Due

**Table 4**
Average scores, on a 7-point Likert scale, on other-regarding motives in different settings and roles.

| Role | Setting | Cooperative | Ingroup trust | Outgroup trust | Obligated | Utilitarian |
|---|---|---|---|---|---|---|
| Proposer | Second Life | 4.52 | 4.44 | 3.08 | 3.27 | 4.95 |
| | Lab | 4.87 | 4.07 | 2.88 | 2.74 | 5.13 |
| Responder | Second Life | 4.88 | 4.44 | 3.36 | 4.33 | 4.78 |
| | Lab | 4.81 | 3.74 | 2.91 | 4.78 | 4.67 |

**Table 5**
Regressions on motives for proposers and responders proportions sent and returned are the dependent variables and treatment and motives are the independent variables. Standard errors are in parentheses.

(a) Proposers

| | Lab proposer dependent variable: proportion sent full regression | Lab proposer dependent variable: proportion sent trust only | SL proposer dependent variable: proportion sent full regression | SL proposer dependent variable: proportion sent trust only |
|---|---|---|---|---|
| Intercept | 17.355[b] (8.228) | 52.627[b] (7.615) | 0.284 (7.292) | 29.244[b] (7.125) |
| Trust | −0.898 (1.599) | 5.147[b] (1.633) | 1.284 (1.806) | 8.421[b] (1.790) |
| Cooperative | 6.391[b] (2.144) | – | 8.433[b] (1.686) | – |
| Utilitarian | 5.817[b] (1.713) | – | 3.330[b] (1.513) | – |

(b) Responders

| | Lab responder dependent variable: proportion sent | SL responder dependent variable: proportion sent |
|---|---|---|
| Intercept | 15.030[a] (7.708) | 0.654 (7.346) |
| Obligated | −0.825 (1.506) | 2.401 (1.433) |
| Cooperative | 1.138 (1.743) | −0.628 (1.711) |
| Utilitarian | 4.624[b] (1.508) | 4.418[b] (1.389) |

[a] Significant at 10% level.
[b] Significant at 5% level.

to the high correlation between the various motives, we also examined each motive separately. In that case, trust shows to significantly affect the amount sent in both the lab and the field. Given the evidence that the university-recruited and Second Life residents (responders more than proposers) might have different levels of trust, this could explain the different amounts being sent.

The proportion returned by responders, in both the lab and the field, is significantly increasing only in utilitarian motives. Given that the lab and field are not significantly different in levels of utilitarian sentiment, this cannot explain the different amounts being sent. Even though ingroup and outgroup trust should not affect responder behavior, we checked these as potential explanatory variables and they did not come out significant. As a sole explanatory variable, the level of obligation is significant with $p$-value = 0.03 in Second Life residents but not university-recruited subjects. Hence, it may be that the explanation for the differences between the lab and Second Life subjects is that the level of obligation – about the same in both conditions – is only mapped into action in Second Life.

## 4. Conclusions

There are two possible approaches when using virtual world interfaces for artefactual and framed experiments. The first is to bring student subjects to the lab with the usual recruiting methods, and to use the virtual world as an interface or platform. The second approach, the field approach, is to both recruit the subjects and run the experiment in the virtual world.

We presented results from trust games conducted in Second Life using both approaches as well as a control treatment. This provided us with the ability to assess both subject pool and platform effects. We found that the personal interaction enabled by the virtual world platform significantly increased the amount sent by proposers.

The term “field experiment” is still under debate and may mean different things to different audiences. We justify our claim to have conducted a “field experiment” by the fact that we went to the field (the virtual world), recruited subjects from the field in addition to the usual university subject pool, and permitted them to interact in the field as they normally would (face-to-face unstructured communication). To the extent that the term “field experiment” is still under debate, we hope that this clarifies what we mean by it.

A framework for evaluating the generalizability of lab behavior to the field has been proposed by Levitt and List (2007a), building on Harrison and List (2004). The framework raises several important aspects for comparison between lab and field. Key aspects from that framework in the present context are (1) scrutiny, (2) anonymity, (3) context, (4) stakes, and (5) selection. We find this framework useful for highlighting the merits of the present setting.

### 4.1. Scrutiny

Similar to other experiments that compare field and lab settings, such as Gneezy et al. (2004), we find that, controlling for interface effects, participants exhibit considerably higher levels of trusting behavior in the lab than in the field, even though field participants report higher levels of trust in the questionnaire than lab participants. Levitt and List (2007a) suggest that scrutiny will exaggerate the importance of pro-social behaviors relative to environments with less scrutiny. Even though we applied the same kind of monitoring in the lab and the field (a monitor avatar was present in the virtual room during all experimental communication sessions) and the final decision was made in private, we believe that the moral costs of non-social behavior are higher in the lab than in the field since participants know that the monitors are within spatial proximity whereas in the field experiments, the monitors might be located in a different city, country or even on a different continent.

### 4.2. Anonymity

In laboratory experiments, the issue of anonymity has long dominated the discussion of experimental design. Hoffman et al. (1994, 1996) implemented a double-blind experimental procedure allowing for anonymity between experimenter and participants. They found that donation amounts drastically dropped with the double-blind procedure. List et al. (2004) found similar results in public good giving. Davis and Holt (1993) note that such results "indicate that this apparent generosity is not altruism, but rather seems to arise largely from concerns about opinions of outside observers".

Anonymity can be broken down to three aspects: anonymity relative to other participants, anonymity relative to the experimenter, and reputation formation. In the experiments discussed in the present work, care was taken to maintain a degree of anonymity in all three dimensions. While the conversation phase involved no virtual-face anonymity, the decision making phase was done through privately viewed windows with the matching of proposer and responder done so as to prevent perfect identification of one's partner. Specifically, participants conversed in groups of three and were randomly assigned as proposer and responder knowing only whether they were matched with someone from their own group (but not with whom exactly). Since the decisions were done in private on a website and the matching was done via a computerized database, anonymity with respect to the experimenter was maintained as well. Lastly, interactions were one-shot in order to avoid reputation formation.

Anonymity between subjects regarding their true (non-virtual-world) identity was also largely maintained. In Second Life, avatars' real-world owners remained anonymous. Lab participants used standard avatars that were generated for the experiment and then disposed of. Anonymity is, however, reduced in the virtual setting due to the pre-play communication. The evidence is that lab subjects with Second Life avatars greatly alter their behavior. Haley and Fessler (2005) find that dictator game giving increases when a pair of eyes is shown on the screen. In our case, this pair of eyes is accompanied by a face and a body, so in that sense anonymity decreases.

### 4.3. Context

Another crucial difference between the lab and the field is context. As Harrison and List (2004) and Levitt and List (2007a) point out, social norms can be extremely sensitive to context. The environment, including furniture arrangement and décor may influence behavior (Harrison and List, 2004). We tried different room decors in Second Life but found no significant effect. Nevertheless, the physical characteristics of the environment are much more easily manipulated in virtual worlds and this is perhaps an avenue for future research (see Atlas and Putterman, 2009). List (2006) found that sports card dealers behaved in the lab in a manner very similar to university-recruited subjects. But they behaved very differently in their natural field. To the extent that our Second Life subjects felt that the controlled environment we placed them in resembled their "natural habitat" (was less artificial than either the laboratory or the Second Life setting would seem to the typical university subject), this might account for the results we observed. More relevant for the present investigation is the task itself. Pre-play communication for laboratory subjects may feel forced, as subjects arrive for an experiment—not a chatting exercise. In Second Life, subjects' primary in-world activity is social interaction. The communication tools are familiar and natural and the conversation flows freely. As such, a study of pre-play communication has a much more natural feel to it in Second Life.

### 4.4. Stakes

High stakes are generally known to reduce social considerations (Slonim and Roth, 1998; Parco et al., 2002). In the present setting, while the dollar incentives were the same between the lab and Second Life, they were considered high relative to wages in Second Life. This might be partially responsible for the less social behavior observed by Second Life subjects relative to the university-recruited subjects interacting in a Second Life platform.

### 4.5. Selection

There is some research (see reviews in Harrison and List, 2004; Levitt and List, 2007a) to indicate that university subjects may be different than the population at large and may be more prone to seek social approval. The population we accessed in

our Second Life experiments is more diverse in age, nationality and occupation than our university population. Furthermore, the emphasis in Second Life on profit-making and entrepreneurial behavior may create a self-selection of subjects that are less likely to be benevolent.

Virtual worlds such as Second Life may offer more realism than the laboratory because social interactions and economic exchanges in these worlds can be observed in settings that are familiar and natural to residents. Desirable aspects, in terms of the framework we just discussed, include richer context, relatively higher stakes (compared to in-world earning power) and selection diversity relative to homogenous student populations. The above framework also points to a loss of control, relative to the laboratory, in terms of reduced levels of scrutiny and anonymity. Nevertheless, virtual worlds enable the experimenter to exert a higher degree of control over the experimental environment than many non-virtual field settings. Virtual worlds such as Second Life allow for screening and blocking of participants, double-blind procedures, randomization regarding recruitment and matching of participants and identification of IP addresses and participating client names (see Bloomfield and Rennekamp, 2008; Atlas, 2008, for an overview on possible measures to exercise control in virtual world experiments). An added benefit in terms of control is that field experiments in virtual worlds lend themselves to relatively easy replication in terms of protocol (Levitt and List, 2009).

It is important to stress that findings with virtual world participants may not be seamlessly extrapolated to other economic settings (Levitt and List, 2007a). Also, as in any internet-based research endeavor, measures such as running double-blind procedures, ensuring that participants believe that they are matched with a real person, appeals directed to the honesty and fairness of the participants, requiring a certain experience, collecting IP addresses and guaranteeing an anonymous data analysis and strict confidentiality are helpful in reducing problems associated with self-reported measures and playing the game more than once but are no guarantee for eliminating them (Anderhub et al., 2001; Drehmann et al., 2005, 2007; Eckel and Wilson, 2006).

In the search for the ideal experimental environment, there is an inherent tradeoff between control and realism, where the laboratory is advantaged in the former and the field is advantaged in the latter. A middle of the road between the lab and the field may be found in virtual world experiments, which provide both limited realism and a considerable measure of control. It is important to stress that the increased realism of virtual world relative to the lab comes from the participants' familiarity and everyday experience with social interaction in virtual worlds. Without that familiarity and experience, virtual world communication is no more realistic than computerized communication in the lab—much as an internet auction is no more realistic than a laboratory auction to someone uninitiated with such a platform.

## Appendix A. Discussion questions for interaction in Second Life

### *A.1. Personal topics*

(1) Each person in the group should introduce themselves and say what school they attend/attended, what year they are or were in school, and what day is their birthday.
(2) Each person in the group should tell about their favorite birthday when they were a child.
(3) Each person in the group should tell how they would normally celebrate their birthday with their family.
(4) Each person in the group should explain what their ideal birthday celebration would be.
(5) Each person in the group should explain what their favorite holiday looks like.

### *A.2. Impersonal topics*

(1) What are the ten most populated cities in the world?
(2) As recorded by the United Nations, what five countries have the highest cost of living in the world?
(3) Using both the Fahrenheit and Celsius (Centigrade) Scales:
    (A) What is the boiling point of water?
    (B) What is the freezing point of water?
    (C) What temperature is absolute zero?
(4) What country contains the highest mountains in the world? Name them?
(5) What 6 countries border Zambia in Southern Africa?
(6) Name 3 countries which refer to their unit of currency as the "dollar"?
    Name 3 countries which refer to their unit of currency as the "franc"?
    Name 3 countries which refer to their unit of currency as the "peso"?
(7) Estimate the distance in miles or kilometers between Paris and the following world cities:

Paris → Hong Kong
Paris → Sydney
Paris → Moscow
Paris → Stockholm

## Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.jebo.2009.07.013.

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