Trust in Second Life

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Abstract: Some issues are raised with regard to conducting economic decision-making experiments in virtual worlds. Some suggestions for addressing these issues are proposed. The problems are illustrated via a visit to an experimental laboratory on Second Life.

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1. Introduction

Traditionally, economic decision-making experiments have been conducted within the confines of the laboratory where researchers can exert a high degree of control over the environment in which the paid human subjects make decisions. This control enables researchers to more confidently evaluate whether any *single* change in a "treatment" variable has, *ceteris paribus*, an effect on subjects' choices, and if so, whether the change in the treatment variable affects behavior in the manner predicted by some theory. This methodology is the best that economists have for assessing whether a change in a single aspect of the environment is *causal* for a change in the behavior of economic agents.

While the controlled laboratory approach to experimentation is "internally valid" – it provides researchers with an ideal method for understanding causal relationships (see, e.g., Guala (2005)) – the *external* relevance of laboratory experiments to the "real world" has been greeted with much skepticism by the economics profession (see, e.g., Levitt and List (2007). In response, a number of experimentalists have begun venturing outside the laboratory, conducting field experiments with the aim of increasing the "external validity" of the experimental methodology (see, e.g., Harrison and List (2004)). One field in which experimentalists have begun to play is the virtual world of Massively Multiplayer Online Role-Playing Games (MMORPGs), where large numbers of participants interact with one another in the guise of *avatars* in a 3-D, computer-generated environment. Among the largest such games (in terms of the number of subscribers) over the past few years are: World of Warcraft (WoW), Runescape, Lineage I&II and Second Life.[1]

The idea of conducting controlled, economic decision-making experiments in virtual worlds is intriguing and has a number of advantages (see, e.g., Bainbridge (2007), Bloomfield (2007), Castranova (2006)). These games have millions of subscribers, many of whom are online at any given moment in time.[2] Further, the population of players in these games is more diverse in terms of socioeconomic characteristics than is the standard laboratory subject population (undergraduate students)—see, e.g., Yee (2006)[3] However, further exploration of the possibility of doing experiments in virtual worlds reveals a number of difficulties with conducting experiments in such environments. For instance, there is little control over who shows up to participate, their attentiveness/cognitive abilities/educational attainment, their incentives to participate, and indeed, the truthfulness of any demographic or other information they provide to the researchers conducting the experiment. One aim of this note is to point out a number of such problems this author has encountered while trying to conduct experimental research in virtual worlds (Armstrong and Duffy 2010). A second aim is to suggest a number of methodological fixes that, while imperfect, may nevertheless allow researchers to overcome some of these problems.

2. Problems and Potential Solutions

In this section I consider a number of problems that researcher may encounter in conducting experiments in virtual worlds. Many of the problems discussed in this section pertain more generally to the conduct of internet experiments--see, e.g., Anderhub et al. (2001). To the extent possible, the discussion here will be made germane to virtual world experiments in particular. Problems of the *generalizability* of virtual world research findings to other populations are addressed elsewhere, e.g., in Fiedler and Haruvy (2009).

2*.1 Recruitment, Screening and Retention of Virtual World Subjects*

Recruiting participants in virtual worlds "in-game" can be difficult, as participants are typically engaged in the game's "quests," "battles" or other activities that offer greater rewards and are, in fact, the reason that they are playing the game in the first place. This is less of an issue in virtual worlds such as Second Life where there no directed goals for advancement/player development. But in other virtual worlds, e.g. World of Warcraft, recruitment of subjects to participate in activities that do advance their skills or player levels can be more difficult.

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[1] http://www.mmogchart.com/

[2] As a macroeconomist, I find such environments exciting as they may more closely approximate competitive market assumptions, and the use of various forms of money in all MMORPs suggests intriguing experiments with regard to monetary policy that would be impossible (not to mention unethical) to do in the real world.

[3] Yee (2006) documents that MMORPG users "are not primarily adolescent students." For instance, in his sample, 50% of players worked full-time, 36% were married, and 22% had children.

Recruitment is made all the more difficult if the researcher must get the informed consent of subjects prior to their participation in the experiment, or if pre-experiment screening procedures are to be employed. Such formal pre-experiment processes should be minimized to the extent possible so as to avoid discouraging participation. As discussed below, some screening can be postponed until after the experiment has been completed.

Further, in anonymous virtual worlds, unlike the physical laboratory, subjects may unexpectedly disappear for a variety of reasons; boredom, some urgent (human) task, or a server crash/power outage.

One potential solution is to use message boards or fan sites/blogs to direct subjects to the experimental locale at a fixed date and time (Fiedler and Haruvy (2009)). This avoids the need to "cold-call" subjects engaged in a leisure activity to participate in an experiment. (In this author's experience, recruiting subjects in game was often met with suspicion by players wondering about the experimenter's true intentions). An even better solution is to direct subjects to the researcher's own external website where potential recruits can read a consent form and schedule a time to participate in an experiment. An external experimental website will also enable subjects to reschedule their participation in an experiment, e.g., in the event that they unexpectedly have to leave the game.

3.2 Public knowledge

Once recruitment occurs, getting subjects to read, comprehend, and understand the public/private nature of experimental instructions may also be more difficult than in the typical laboratory experiment. Implementation of public knowledge (the approximation of common knowledge) of the experimental instructions is difficult if not impossible, if participants cannot observe that the other participants with whom they will interact, are also being read or quizzed about the same set of instructions. Implementation of private information may be subject to credibility problems.

A solution to this problem is difficult. Directing all subjects to a common external website may work to implement public knowledge of the instructions. Subjects can be instructed to open the instructions in one browser window while participating in the experiment in another window. To the extent possible, assembling the virtual subjects in the same location and posting/reading the instructions to all participants (as in laboratory studies) may be the best approach. As usual in experimental economics, requiring that subjects complete a quiz may also be useful.

3.2 Collection and Validation of Demographic Information

Often it is of interest to collect demographic data on variables such as the age, race and gender and educational background of participants, either because these variables are of interest in their own right, or for screening purposes (e.g., one only wants to consider the decisions of adults –those aged 18 years or older). The collection of such data in virtual worlds is confounded by the inability to physically observe the sender of that data. Furthermore, the participant may be confused as to whether the demographic information refers to him/her or to his/her avatar. Game players may not consist of single individuals but rather as teams of individuals.

To minimize such problems, experimenters should compensate participants for the time it takes to complete demographic data using the same in-game currency offered as payment for the experiment itself. A good practice is to pay subjects for their participation in the experiment first, thereby establishing a certain amount of trust that the experimenter makes good on promises to pay. Then, subjects can be directed to an external experimenter website to complete a demographic survey with the promise of additional payment (as e.g., in Chesney et al. 2009). Survey questions should be kept to a minimum to maximize participation and to ensure a complete data record. As for validation of the data submitted, the use of an external experimenter website to collect demographic data again has certain advantages. Questions can be presented in a multiple choice format, e.g. radio button for gender, educational attainment, etc., so as to avoid useless answers. Some questions, such as country of residence, may be validated by the collection of data on the domain/country of a participants' server using third party, web site analytics software coincident with the time a participant is answering the survey questions (as in Armstrong and Duffy (2010). If the country of residence collected using the analytic software matches that given in the survey, there is reason to be more confident that other survey answers may be truthful. Mismatches might be grounds for eliminating the data record.

The demographic data can be used to screen participants ex-post, provided that the researcher has well-defined screening criteria and adheres to these. For instance, one might want to restrict players to be 18 years of age and older with some minimum level of educational attainment, e.g., a high school diploma.

3.3 Control of Communication/Collusion

The anonymity of virtual world interfaces means that control of collusion and communication between subjects must be considered in advance of experimentation. It is well known from laboratory experiments that communication opportunities can work to facilitate collusion (Holt (1995)) or to overcome hidden (asymmetric) information (Charness and Dufwenberg (2006)). In virtual world settings, communication protocols may be a desirable addition to the experimental design (as in Fiedler (2009) or a hindrance to controlling agent interactions.

In many MMORPGs, gamers are directed to choose a server ("shard") when they log on. Communication and/or movement of avatars across shards is not generally possible (e.g., in World of Warcraft) so one way to prevent communication/collusion is to simultaneously conduct the experiment on two or more different shards. In Second Life, this is not possible, so, if desired, stricter protocols limiting communication among participants must be adopted (as in Fiedler and Haruvy (2009)). Of course, one can always match participants up anonymously but this raises credibility problems, for instance, as to whether a player is really playing with one or more other players.

Another form of collusion that is difficult to avoid is repeat participation in a research study by the *same* individual using different avatars. This is difficult to address other than by using the screening methods suggested earlier. One screening/survey question might ask how many avatars an individual maintains in the game and restricting the data records based on the answer to that question. Anderhub et al. (2001) suggest preventing repeat participation by subjects who use the same email address which is, of course quite sensible, but many players have multiple, free email addresses.

3.4 Embedding the Experiment in the Virtual World

Ideally, one would like to embed as many features of the virtual world in the experimental intervention as possible so that the experimental intervention makes maximal use of the virtual environment in which participants interact with one another and minimizes the fact that an experiment is being conducted. After all, why else should one wish to experiment in a virtual world? Ease of recruiting a (more) diversified subject pool, as suggested e.g., by Chesney et al (2009), is by itself not a good reason to experiment in virtual worlds as there already exist non-virtual world mechanisms for recruitment of subjects in internet-based experiments, see, for example, Mechanical Turk (Paolacci et al. (2010)). Instead, the experimental studies in virtual worlds should exploit one or more features of that virtual world that would be difficult or impossible to replicate by other means, e.g., in a laboratory or internet experiment.

One obvious feature to embed is the use of the in-game currency (or other game rewards) to pay experimental subjects. Transfer of in-game currency/goods can typically be done instantly via player-to-player transfer protocols. As Chesney et al. note, the value of an in-game currency (e.g. Linden dollars in Second Life) which is required for all in game exchanges may exceed the real-money equivalent value of the same amount of in-game currency, as it may be time-consuming to earn in-game currency. (Many games have active real-money markets that allow gamers to buy and sell in-game currency to others at a real-money (i.e. U.S. dollar), endogenously determined exchange rate). Spann et al. (2010) present evidence suggesting that large variations in the amount of in-game currency rewards together with the immersion of subjects as avatars "in-game" can lead to significant differences in allocation decisions as compared with experiments were the same subjects are not in-game and are paid using real-world currencies (in their study, Euros).

A second important feature of virtual worlds that can be exploited is their visual and communication protocols. Fiedler (2009) for instance, considers whether audio pre-play chat in Second Life affects cooperation rates in a two-player "trust game" relative to the case of simple text chat (using Skype) or no communication at all. Similarly, in their Second Life experiment, Atlas and Putterman (2010) confront experimental subjects with differing visual images in an effort to reinforce optimistic or cautionary written instructions. They argue that such visual imagery is easier to control in a virtual world than in a "brick-and-mortar" lab.

Nicklisch and Salz (2008) have gone the furthest with embedding an experiment into a virtual world. They pay subjects in WoW the in-game currency-- gold coins-- in exchange for subjects' avatars' performing an in-game task, namely fishing at a certain (virtual) lake for thirty minutes. Recruited subjects are asked to return their catch of fish to the experimenter's avatar. This simple "gift exchange" experimental design, intended to study reciprocity, has the virtue that the subjects don't even know they are involved in an experiment. Nicklisch and Salz also vary the amount of the gold offered and the rank level (status) of the experimenter's avatar to assess the impacts of these variables on the amount of fish returned.

Armstrong and Duffy (2010) match virtual world players together to play one-shot, 2-player coordination games in WoW and prior to play of these games, they reveal to each player in-game characteristics of the opposing player, i.e. their WoW race, class and player level to see whether differences in these characteristics matter for equilibrium selection. Such status metrics are difficult to generate with as much meaning outside of the virtual game world.

Summarizing, there are a number of problems associated with conducting laboratory experiments in virtual worlds and we have offered some potential solutions. Virtual world experimentation lacks the control of the laboratory but has other benefits. The greatest benefit from conducting experimental research in virtual worlds, as opposed to other online communities does not come from the low-cost and greater diversity of the subject pool but rather from the exploitation of virtual world features that would be difficult to engineer in a more controlled laboratory setting.

3. An Illustration

This section describes an unannounced visit by the author to the Brown-Tufts Experimental Economics Laboratory on Linden Lab's *Second Life* on February 1, 2008. The visit was initiated by my own curiosity as to how experiments could be conducted in virtual worlds. The experiment in progress at that time is described in Atlas (2008); Atlas and Putterman (2010) use a similar design, and the interested reader is referred to those papers for the details of what the experiment was seeking to address. The visit described here should not be considered to be representative of all virtual world research. However it does serve to illustrate a number of the problems described in the previous section.

Figure 1 shows the author's avatar outside the Brown-Tufts experimental laboratory, one of several that were operating on Second Life at that time. Perhaps not surprisingly, the first efforts to conduct experimental research in virtual worlds have largely replicated the laboratory experience, right down to having a physical space for the laboratory and the use of online recruiting. My avatar was able to "teleport" to the lab after searching a message board for its location. Upon arrival, my avatar encountered a strictly self-service type of individual-decision-making experiment. The sign over the door promised $100-400 Linden dollars (the Second Life currency) for a 15 minute experiment. At the exchange rate between Linden and $US dollars at that time (approximately $265 Linden per $1 US), these were relatively *low* stakes compared with typical economic decision-making experiments. On the other hand, as Chesney et al. (2009) argue, it may be that the "in-game" value of Linden dollars to Second Life participants is greater than or equal to U.S. dollar equivalents – it is not so clear, as price indices for virtual worlds do not exist.

There was no pre-screening of any type. My avatar entered the lab and sat down in the chair as the sign over the door instructed.

Figure 1: Arrival at the Tufts-Brown Experimental Economics Lab in Second Life, February 1, 2008.

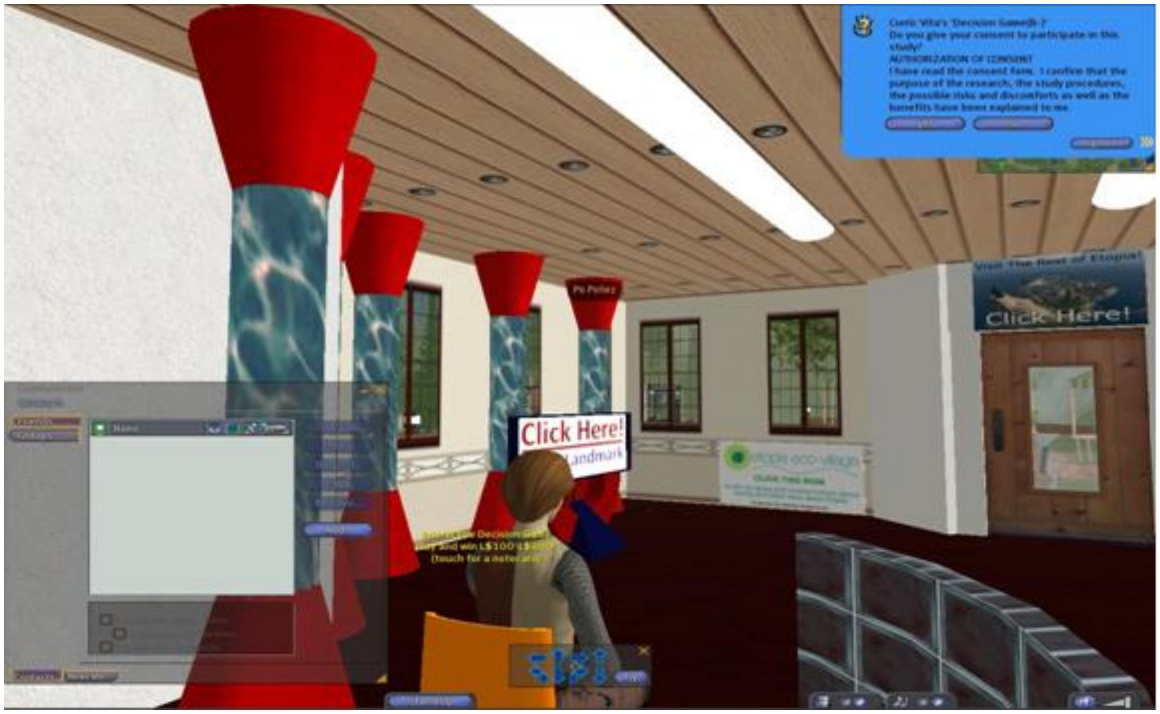


Figure 2: Participating in a trust game experiment. No other avatars are present.

After sitting down, my avatar was prompted to read a consent form. In the U.S., the conduct of experimental research in virtual worlds falls in the "expedited" category and so continues to governed by the appropriate Institutional Review Board (IRB). This is not the case in other countries so there may be an advantage to conducting virtual world research outside of the U.S.

After giving consent, my avatar is asked to state his *age*. As I viewed my avatar as a younger version myself, the age reported was not *my* age but rather the age of my younger (and handsomer) avatar. This can be viewed as a "lie", or more charitably, a misperception of whether the information requested pertains to the "gamer" or his or her "avatar".

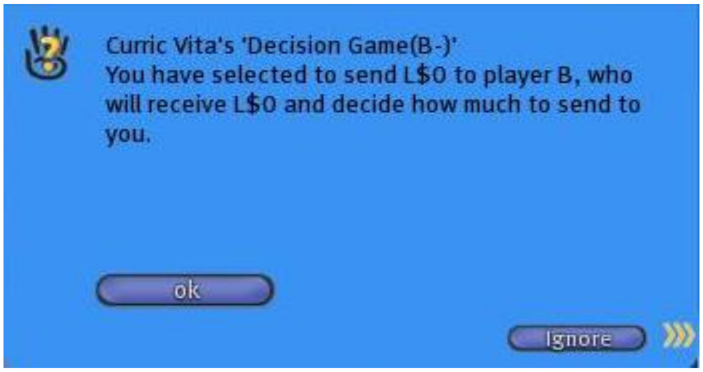
Next, the experimental instructions appeared in a series of boxes in the upper right hand corner of the screen. My avatar was instructed that he was matched with another anonymous participant and that both of us had been endowed with a show-up fee of L$100 Linden dollars (US $0.38). The instructions indicate that in the experiment, one of us will have to decide whether to give up some, all, or none of our show-up fee (endowment) to the other participant.

There are no other visible avatars in the laboratory nor is there any communication with any other participant. This does not inspire confidence in the notion that my avatar is actually playing a game with another player. By contrast, Chesney et al. (2008) do reveal the avatars of the other experimental participants as well as the presence of experimenter avatars. The better design approach is not so clear; as Atlas and Putterman (2010) emphasize, the absence of an "experimenter" avatar may reduce experimenter demand effects (Zizzo 2010), wherein subjects who are being watched take actions they think will please the experimenter. Varying the presence of an experimenter avatar would be a good subject for future research. However, the absence of other experimental subjects does lead me to question whether the other player is real, whether those other participants have been given the same instructions (public information), or whether the environment is being completely controlled by the experimenters who are playing the role of the other player.

Reading through the rest of the written instructions it becomes clear that my avatar is a player in Berg et al.'s (1995) "investment" game, also known as the "trust" game. In that game, both players are endowed with L$100. The first mover, player A, chooses an amount $S \in [0, L\$100]$ to send to the second mover, player B. Amounts were restricted to be integers in the game played by my avatar. Any amount sent is then exogenously tripled by the experimenter. If $S>0$, Player B then decides how much of the tripled amount $3S$ to keep, K, for himself, with the remainder $3S$-K going to Player A. Finally, the resulting allocation is revealed. The game is then over.

In the one-shot version of this game – the game my avatar was playing was one-shot- the unique subgame perfect equilibrium prediction is that the second mover, player B, will keep all $3S$ of the money for himself, i.e., $K=3S$, and therefore, the first mover player A, is better off not sending the second mover anything, $S=0$, keeping L$100 for himself.

My avatar was designated as the first mover –Player A. Knowing the game, I had my avatar play according to the subgame perfect equilibrium and chose to send L$0 to the second mover, Player B:



After clicking OK and earning L$100, my avatar was prompted to answer 28 demographic and background questions for no extra payment. Considering the real cash value of my final earnings, I decided this was not worth my time and so I had my avatar prematurely quit the experiment at this stage. Hopefully, as a consequence, this data were not recorded by Mr. Atlas for publication purposes.

This illustration underscores the problems discussed in the previous section. Public knowledge by other players of the game or the instructions was not clearly established.

Indeed, no other participant was present at the time my avatar made decisions. As a participant, I was able to lie about my age and participate in a decision-making experiment despite prior knowledge of the game, an understanding the equilibrium prediction and presumably the hypothesis the researchers were testing. My misinformation and background were not properly vetted in any way. The low stakes offered for participating in the study caused me to drop out prematurely, which should raise concerns about possible selection biases.

The Brown-Tufts lab is just one virtual laboratory but others, e.g., the one shown in Chesney et al. (2009, Figure 2) appear rather similar. In any such virtual laboratory, there will be issues of sample selection and of the truthfulness of demographic information; in virtual worlds, pretending-to-be-someone-other-than-you-are is something of a norm (hence "*second* life") and indeed, may be the primary motivation for participation. More generally, this same critique applies to any anonymous experiment conducted over the internet. For example, there is little control over whether the *same* individual is logged in on multiple machines, under different identities, perhaps playing a two-person game with himself. Of course, traditional laboratory experiments also face a number of control issues, for instance the experience level that subjects bring with them, which have been addressed at length elsewhere (see, e.g., Levitt and List (2007)). However, it does seem easier to monitor, screen and retain subjects when they meet together in a physical laboratory under the observation of an experimenter, than in a virtual world environment.

4. Conclusions

Virtual worlds are potentially rich environments for experimental interventions, as they have many players from a wide variety of backgrounds interacting with one another at any moment in time. This pool of subjects is more easily accessible to researchers than the typical pool of subjects "in the field." Subjects may be recruited at lower cost. For these reasons, virtual world experimentation has and will become an increasingly attractive choice for experimental research. However, as I have argued and illustrated in this paper, there are a number of potential pitfalls involved in conducting experimental research in virtual worlds that researchers should be aware of and seek to minimize to the extent possible. Addressing these issues will require that researchers modify the standard protocols used in laboratory studies to address both problems and benefits of virtual world environments.

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