

STUDENT PARTICIPATION IN EXPERIMENTAL ECONOMICS

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Abstract: Evolving from the early work of John Nash, experimental economics provides laboratory-type opportunities for enhancing student involvement and interest in undergraduate and master's level law courses.¹ Experimental economics makes use of material incentives to motivate participants to make realistic choices.² In one typical application, subjecting students to various well-known risks allows likely responses to Internet legislation to be identified and quantified through sensitivity analyses in a laboratory setting.³ So, experimental economics can provide a vehicle for achieving multiple desirable classroom goals: introducing students to the effects of consumer protection legislation, yielding potentially interesting research results, and simultaneously introducing students to a powerful technique for hypothesis testing. The initial experiments have focused on job search settings, but are illustrative of an extensive range of potential topics.⁴ Two semesters of administering economic experiments involving Internet legislation, and some of the risks inherent in Internet usage, convinces us that in addition to research utility, experiment economics can significantly enhance student interest.

I. Introduction

An obvious key to generating student interest in a business law or legal environment course is relating students' everyday experiences to what is being taught in the classroom. At this date, it is safe to assume that all U.S. students spend significant periods of time in front of a computer and on the Internet.⁵ Given the current cost of a college education,

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¹ J. Nash, Jr., *Noncooperative Games*, 54 ANNALS OF MATHEMATICS 286 (1951). The significance of John Nash on the fields of economics and mathematics is summarized by Sylvia Nasar, *The Essential John Nash*, available at <http://www.pupress.princeton.edu/chapters/i7238.html> (2001).

² R. Forsythe, J.L. Horowitz, N.E. Savin, and M. Sefton, *Fairness in Simple Bargaining Experiments*, 6 GAMES AND BARGAINING BEHAVIOR 347 (1994).

³ D.L. Baumer, J.C. Poindexter, and J.B. Earp, *Quantifying Privacy Choices with Experimental Economics*, (unpublished manuscript, available at: <http://infoecon.net/workshop/schedule.php>) paper to be presented at the Workshop on the Economics of Informational Security at the Kennedy School of Government in Harvard, June 2-4 2005. In this paper we analyze the impact of health information regulations and a computer virus outbreak on choices made by job seekers who have options as to websites chosen and various forms of protection. Most traditional economic studies examine empirical events that have taken place in the past, such as price and quantity data, and use sophisticated statistical tools to identify cause and effect. Experimental economics makes use of laboratory techniques; participants in economic experiments are subjected to a change in a single variable in order to estimate its effect. Laboratory methods are used in economic experiments to increase confidence in the results.

⁴ *Id.*

⁵ A study by ChildTrendsDatabank, *Home Computer Access and Internet Use*, available at http://www.childtrendsdatabank.org/pdf/69_PDF.pdf reveals that in 2001, 71% of three to seventeen year olds had access to computers at home.

virtually all students are interested in getting a good-paying job upon graduation and most of these students will be using the Internet in their job search. In this setting, to attract employers, students will submit electronic versions of their resumes to various employment-related, websites. Student resumes typically contain a good deal of personally identifying information (PII).⁶ Moreover, employers sometimes request more information than appears on resumes, including social security numbers. Except for those covered by the Americans with Disabilities Act, we assumed prospective employers may also request health information.⁷ For the past year, we have used student volunteers to participate in various economic experiments involving Internet job searches in which a lengthy list of risks confront their online activities.

A. Short Primer on Experimental Economics

According to John Nash (of *Beautiful Mind* fame), when the number of actors is small, Adam Smith's alleged regime of narrow self-interest as a predictor of behavior breaks down because non-anonymous individuals often cooperate rather than single-mindedly pursue their own goals without reference to the choices made by others.⁸ Nash's mathematical modeling permitted tests of the basic assumptions of economic theory and with that, opened the door for the development of the field of experimental economics.⁹ Experimental economics relies on the same laboratory methods used by the hard sciences, employing repetitive experimentation with human participants to test proposed theories.¹⁰ The basic methodology of the lab experiments conducted requires creation of a situation in which participants are presented with choices and are motivated by money (or some other real and current interest) to make choices that promote their self-interest. Once an equilibrium in the model under investigation (often described as a "Nash" equilibrium) is achieved, the system can *shocked* by altering a single variable with the resulting changes in equilibrium choices attributable to the changes in that variable.¹¹

B. Economic Experiments Compared to Surveys and Polls

⁶ "PII" is commonly used in the privacy literature to stand for personally identifying information. PII includes some or all of the following: name, address, email address, demographic information, financial records, employer, medical information, social security number and other information. See e.g., David L. Baumer, Julie B. Earp, Pamela Evers, *Tit for Tat in Cyberspace: Consumer and Web Site Responses to Anarchy in the Market for Personal Information*, 4(2) UNIVERSITY OF NORTH CAROLINA JOURNAL OF LAW AND TECHNOLOGY 217 (2003).

⁷ Americans with Disability Act of 1990, 42 U.S.C. Sections 12102-12118 (2002).

⁸ See J. Nash, *supra* note 1. ADAM SMITH, AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS (1776).

⁹ Perhaps the definitive application of Nash's work is contained in THE HANDBOOK OF EXPERIMENTAL ECONOMICS (JOHN H. KAGEL AND ALVIN E. ROTH, eds., Princeton University Press, 1995).

¹⁰ *Id.*

¹¹ Nash equilibrium is described in F. M. SCHERER AND DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND MARKET PERFORMANCE (1990) at 209.

Experimental economics evolved in part because of the unreliability of surveys and polls.¹² Numerous studies have shown that when surveyed, respondents are irrational, e.g., under some scenarios they prefer A to B and B to C, but they also prefer C to A.¹³ According to some published studies, survey respondents are motivated to answer survey questions in ways that make them appear admirable to their questioners.¹⁴ Subsequent monitoring of behavior often reveals major deviations between actual behavior and survey results. Since survey respondents bear no real consequences from their responses, it isn't surprising that they often respond in ways that they think will impress interviewers, or that they are simply careless in their responses since there are no consequences, positive or negative, that flow from capricious choices. With a focus on assessing survey design and resulting reliability, an ongoing economic experiment has been taking place in the Iowa Electronic Market. Forsythe, et al., report that, when voters are given a monetary stake in outcomes, as is the case in the Iowa Electronic Market (IEM), participants' predictions: 1) are superior to those gathered via exit polls and 2) contain less forecasting error in the periods leading up to elections relative to nationally prominent polls.¹⁵

The distinguishing feature of experimental economics relative to surveys and polls is that participants receive some form of compensation that is linked to the choices they make.¹⁶ In most economic experiments, monetary compensation is used, but grades are also important to students and we have found that grades are well suited for motivating students. In one set of experiments, we allowed students to participate in economic experiments in lieu of completing a term project, while in another we gave students extra credit based on their performance.¹⁷ For the students who participated in economic experiments in lieu of writing a term project, the participants were told that, depending on the *counting money* they had accumulated at the end of the experiments, they would receive project equivalent grades that clearly would help their semester averages if they finished in the top third, would likely be neutral in effect if they were in the middle third, and could have some negative impact on their semester average if they were in the bottom third.

II. Experimental Economics Applied to Job Search

¹² See *The Experimental Economist: Nobel laureate Vernon Smith takes markets places they've never been before*. An interview of Vernon Smith, a Nobel Laureate in Economics in 1992, by Mike Lynch and Nick Gillespie (October, 2002) available at <http://reason.com/hod/fe.ml.smith.shtml>.

¹³ See many of the articles in the JOURNAL OF EXPERIMENTAL ECONOMICS, available at <http://www.people.virginia.edu/~cah2k/experiecon.html>.

¹⁴ J. Smith, S. Milberg, and S. Burke, *Information privacy: measuring individuals' concerns about organizational practices*, 20 MIS QUARTERLY 167 (1996).

¹⁵ R. Forsythe, J.L. Horowitz, N.E. Savin, and M. Sefton, *Fairness in Simple Bargaining Experiments*, 6 GAMES AND BARGAINING BEHAVIOR 347 (1994).

¹⁶ *Supra* note 13.

¹⁷ These experiments are explained in more detail at: J.B. Earp, J.C. Poindexter, and D.L. Baumer, "Quantifying Privacy Choices with Experimental Economics," accepted by the Workshop for the Economics Information Security, (March 2005). Paper will be presented to the Kennedy School of Government, Harvard University, (June 2005).

Job search using the Internet is an activity that is well known to most, if not all, students. Job search is also an excellent vehicle for exploring the effects on user behavior of risks, such as the risk of identity theft, the risk of virus contamination, etc.¹⁸ There certainly are numerous other markets and activities in which the interface between Internet risks and the legal environment is prominent, including online buying, online banking, credit information, and medical information, and file swapping. In all of these settings, Internet users must make decisions about whether and to whom to divulge PII.¹⁹

A. Instructions to Participants

In the pilot economic experiment we have conducted, participants are told that they are graded on the choices they make in searching for a job. Reflecting our read of reality, accessible websites are arranged such that probabilistically accessible starting salaries increase along with the amount of information that participants must be willing to divulge. There are three types of websites:

1. **General Employment Websites (GEWs)** such as Monster.com offer starting salaries of \$30,000 per year, with participants having to submit their resumes.
2. **Employer Websites (EW)** offer starting salaries of \$40,000 per year, but job applicants must be willing to reveal their social security numbers, so that their credit history can be checked.
3. **Headhunter Websites (HW)** offer starting salaries of \$60,000 per year, but applicants must be willing to reveal their social security numbers as well as health information.
4. **Offline Searches (OS)** for those who choose not to submit their resumes online. They are restricted to circulating them to family and friends with an expected starting salary of \$20,000.

Participants earn “money” (counting money) by being hired with an initial duration of employment of three months. At the end of three months a new experiment is conducted in which participants are invited to submit their resumes again to the website or offline location of their choice. Participants have a 50 percent chance of being hired at each website, but they must submit more information to be hired at the websites with higher starting salaries. Participants are told that the chances of being a victim of identity theft are significantly greater if they submit their social security numbers. According to data from the “Federal Trade Commission” the average costs for a victim of identity theft is

¹⁸ According to the Federal Trade Commission which enforces the Identity Theft and Assumption Deterrence Act of 1998, Pub. L. No. 105-318, codified at 18 U.S.C. § 1028, “Identity theft occurs when someone uses your personal information such as your name, Social Security number, credit card number or other identifying information, without your permission to commit fraud or other crimes.” *available at* <http://www.consumer.gov/idtheft/>.

¹⁹ Selective revelation of PII is extensively discussed in Baumer, Earp, and Evers, *supra* note 6.

\$5,000.²⁰ Participants also are told that if they submit health information they could be labeled a “health risk” by organizations that pool health data and make predictions about who is likely to suffer chronic health problems, such as cancer and diabetes. If a person is labeled a health risk (1) they will not be hired and (2) they will have to pay \$1,000 more for health insurance (in other words, their counting money net worth is reduced by \$1,000).

Participants are told that their initial endowments (net worth) are \$5,000.

- If they are hired through a **GEW**, during the first 3 months they will earn \$7,500, but their living expenses are \$5,000 so their net gain is **\$2,500**.
- For those who submit their resumes to **EWs**, they will earn \$10,000 during the three-month period that they are employed, but their living expenses are assumed to be \$6,000 so the increase in their net worth is **\$4,000**.
- Participants who apply to an **HW** for jobs and are hired are assumed to earn \$15,000 in three months, but with living expenses of \$8,000, the three-month gain in net worth is **\$7,000**.
- For those who choose not to submit their resumes online, the average increase in new worth is assumed to be **\$1,000**.

All of these figures are somewhat arbitrary and the most obvious adjustment that could be made would be to reduce these salaries for taxes. Of course, as implied in the discussion above, the money provided and/or earned is play (or monopoly) money that determines participants’ ordinal rank, but is not a “take home” reward from participating in the experiments.

B. First Round of Experiment

Classic applications of experimental economics call for repeated trials until the data indicate that (Nash) equilibrium has been achieved.²¹ In economics, equilibrium is achieved when there is no pressure for change. Once the system is in equilibrium it can be perturbed with exogenous (variable) changes. The results of such perturbations can be observed, measured and repeated if necessary.²²

Applying the concept to this experiment, equilibrium occurs when repeated experiments would cause relatively few participants to change their selection among the available options (three types of websites and the offline choice). Unfortunately, in our pilot tests, we did not have the luxury of repeated experiments so that it could be demonstrated with some certainty that equilibria were achieved. Instead we resorted to a familiar tactic of economists, namely, that we *assumed* the system was at equilibrium after one trial and

²⁰ Participants are told that figure, which is reasonably close to some estimates of the actual figure, General Accounting Office, Identity Theft: Available Data Indicate Growth in Prevalence and Cost, GAO-02-424T (February 14, 2002), at 8-10, available at http://www.gao.gov/new_items/d02424t.pdf.

²¹ See *supra* note 12, at 5.

²² See *supra* note 11, at 22-23.

that changes from the first trial were attributable to the perturbations rather than belated adjustments by participants to achieve equilibrium.

After the participants make their choices, they are asked to name two cities for their preferred location and are told if they land a job in their preferred location that they can increase their salaries by \$2,000. If their job is in a city that is not among the two cities they selected, participants are told that they should subtract \$1,000 from their net worth. The location adjustments are more in the nature of *obiter dicta*, in that **our** real focus is on the changes that legislation and Internet risks cause in participants behavior, but participants are motivated to make choices so as to maximize their income. Certainly other distracting factors could be introduced such as websites whose privacy policies promise nothing and in fact nearly guarantee that any PII released to them will be misused or transferred to unreliable recipients.

C. Results of First Round

Once we received the choices made by participants, we distributed the results of the first round of the experiment as a spreadsheet attachment to an email to all the students. By distributing the results in this manner, participants were aware that they and/or some of their fellow participants were victims of identity theft and/or were identified as a health risk. Also they were aware that a number of participants were successful in their job search while others were not, and that some landed jobs in their preferred locations, while others did not. The actual participants who landed a job can be selected by a random number generator, which can be interfaced with student ID numbers.²³ Alternatively, using the sorting tools on an Excel spreadsheet, it is not difficult to arrange student participants by the choices they made and designate every other student as receiving a job and then randomly selecting those who are dinged by identity thieves or are labeled as health risks.

D. Second Round: Participant Input

An artificial aspect of these experiments is that all participants have to start all over again in the second round as though they had been fired after three months, even if they were among those who had jobs from their first selection. In the second round of experiments, we offered participants the option to purchase protection from identity theft and from being labeled a health risk. For participants who selected EWs and HWs, we offered the option to encrypt their resumes so that if their resumes were intercepted by identity thieves, they would be virtually indecipherable. We set the cost of encryption at \$100. For those who select HWs and want protection from being labeled a health risk, we set the price for encrypting health information at \$500, which is nearly half of the financial risk (cost) of actually being labeled a health risk. Theoretically, with many repeated

²³ Regrettably, until last year, student rolls at NC State University identified students by actual social security numbers. Until recent changes were made, electronic files, accessible by faculty and by students who impersonated faculty, identified students and their social security numbers. In the experiments described in this paper only NCSU-supplied student ID numbers were used, from which their social security numbers cannot be deduced or determined.

experiments we could trace a demand curve for protection from identity theft or from being labeled a health risk. Having witnessed first hand the risks of misappropriation of PII, we have found that most participants, though not all, choose to encrypt their resume information and most encrypted health data as well at the assigned cost levels.

E. Enactment of Health Insurance Portability and Accountability Act (HIPAA) Regulations²⁴

In the third round we ask participants to assume that HIPAA regulations have been enacted.²⁵ We also provide our interpretation of HIPAA regulations, which is that these regulations prohibit distribution of health information without the consent of the patient. Under the assumed facts, we posit that the probability of being labeled a health risk is much reduced because the new HIPAA regulations. By explaining HIPAA regulations and perhaps their interaction with the American with Disabilities Act (ADA) we cause student participants to take notice of and focus on the effects of HIPAA regulations in a manner that has meaning to them that they would not experience in the absence of our economic experiment. Continuing with our experiments, once HIPAA regulations are built into the system, no participant suffers from being labeled a health hazard. Predictably, the proportion of our participants paying to encrypt their health information fell significantly.

F. The Frequency and Severity of Identity Theft Dramatically Increases (Decreases)

For the last round of the economic experiments, participants are told, alternatively, that the incidence of identity theft increases (decreases) and the financial consequences double (are halved). Of course, sudden shifts in Internet risks in the form of identity theft (or new viruses, worms, or spyware) are common as announcements of successful hacking regularly occur. In fact it is not uncommon for hundreds of thousands of customers or users to be notified by large corporations and branches of government that hackers gained access to their PII and that they should take precautions against having their credit destroyed.²⁶ If cyberspace becomes less secure, then we would expect that participants would gravitate towards websites where they are not required to reveal as much information and to spend more for encryption. Again, with repeated experiments it might make sense to vary the cost of encryption to generate data on the demand elasticity (price sensitivity) for a more secure environment in cyberspace. If the pseudo announcement is that the incidence of identity theft is significantly reduced, as are its consequences, we would expect more participants to select websites with the highest expected value in terms of starting salary.

III. Variations and Other Considerations

²⁴ Pub. L. No. 104-191 (1996) codified at 29 U.S.C. Sections 1181 *et seq.*

²⁵ The HIPAA Privacy Rule can be accessed on the Department of Health and Human Services webpage Complete Privacy, Security, and Enforcement (Procedural) Regulation Text, *available at* <http://www.hhs.gov/ocr/hipaa/>. Standards for Privacy of Individually Identifiable Health Information 45 C.F.R. Parts 160 and 164 (2002).

²⁶ See <http://www.epic.org/> for a sampling of security breaches in the private sector.

The discussion above explains what we did in our economic experiments. We focused on the variables that we thought were crucial, but there are many variations that would be interesting to test. This discussion below indicates some possibilities for varying underlying assumptions or variables.

A. Manual versus Online

The economic experiments we conducted were offline, even though we were examining online behavior. By conducting the experiments offline, it was necessary to manually enter the choices made by participants, which is no trivial task.²⁷ A priori, an online site that displays three faux employment websites, plus an offline option seems far superior to conducting all of the experiments offline.²⁸ Through repeated experiments system equilibrium, which is achieved when the amount of choice switching by experiment participants becomes trivial, would be achievable. As discussed above, achievement of equilibrium is crucial so that when new influences are introduced to the environment, the changes in behavior made by participants can be clearly attributed to the new influences rather than adjustments made by participants on the way to equilibrium. On the other hand, in “real life” there are often substantial periods of time between the experience of results from various decisions and the opportunity to make new decisions. Online economic experiments typically compress the time periods between receipt of feedback on the results of their choices and points in time when they are asked to make new decisions.

B. Inducements to Participants

In addition to an extensive literature that analyzes the deficiencies of polls and surveys relative to market participation, as discussed above there are logical reasons why the answers given by survey respondents might differ significantly from their actual behavior when confronted with choices that have real consequences.²⁹ A key feature of experimental economics has been that participants are compensated and are rewarded differentially depending on how well they perform.³⁰ Ideally grant money can be obtained to reward participants who make choices that turn out to be profitable. Alternatively, we used modest adjustments in grades as an inducement to perform as though these choices had significant consequences. The experimental economic literature reports that grades have been used in lieu of pecuniary compensation.³¹ However, post-experiments, there were complaints by some students that some portion of their grade was determined by chance and somehow that was not “kosher,” even though

²⁷ The actual spreadsheet with all four rounds of the economic experiments will be furnished upon request.

²⁸ We are now making use of online websites to conduct economic experiments. See <http://ecommerce.ncsu.edu/pv2/>.

²⁹ See *supra* note 12.

³⁰ *Id.*

³¹ Use of the results of participation in economic experiments is reported e.g., at: <http://www.econ.ucsb.edu/~tedb/Courses/Ec1S02/requirements.html>. For a contrary view of the appropriateness of using economic experiments in the classroom see <http://www.indiana.edu/~econed/pdffiles/spring98/stodder.pdf>.

they voluntarily participated in the experiments, fully informed of the possible consequences.

C. Experiments Involving Humans

Most universities require approval by a review board before experiments involving human subjects can be conducted.³² Of course the purpose of university review boards is to avoid abuses that have occurred in the past in experiments that involved human subjects. Among the concerns of review boards is loss of privacy, which indeed is ironic since the purpose of this exercise is motivated by Internet privacy concerns. It is difficult to argue that experimental economics studies do not involve the experimental use of human subjects. However, for all of the experiments we have considered, protections that anonymize any actual PII data from test subjects are easily put in place. Distribution of spreadsheets reflecting experimental data from our pilot investigations only identifies student participants by numbers, which can easily be delinked from individual identification.³³ An additional

Regulations at NCSU require full institutional review board (IRB) approval if disclosure of “the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects’ financial standing, employability, or reputation.” It would be very difficult to find a link between participant choices with regard to employment websites and the risk of criminal or civil liability, or the other maladies cited in the quote immediately above. Many other economic experiments that would enrich the learning experiences of students in law classes can be envisioned that, as in our study illustration, would expose students to no IRB concerns. So, each teacher who chooses to use experiments in class must consider whether the exercises they make use of even require IRB review. It appears likely that most exercises that can be envisioned would easily receive IRB approval if it is requested.

Other Experiments

The economic experiments described above take place in a job search scenario. Internet risks certainly occur in other settings including online banking, purchasing, and booking travel.³⁴ In each of these settings, the customers have to give up PII and (1) rely upon the integrity of the recipient of their PII to abide by the promises made in its privacy policy and (2) hope that the recipient’s security is adequate to prevent appropriation of PII by hackers. In addition, in the ordinary course of Internet use there are numerous warnings and notices that recommend downloading of certain software as “protection” against

³² Most universities have a review board whose approval must be obtained before experiments involving human subject can be conducted, e.g., <http://www.ncsu.edu/sparcs/irb/>.

³³ As is increasingly the standard, NCSU no longer uses a student’s social security number as his or her student ID number.

³⁴ See Kathy Chu, *Banks and Online Retailers Lost Customers to the Fear of ID Theft*, Wall Street Journal, March 24, 2005, available at, http://online.wsj.com/article_print/0,,SB111163038793988394,00.html, in which banks and online retailers estimate that about 6% of consumers have switched banks and 18% have stopped making online purchases.

adware and spyware. The “protection” software itself is often adware or spyware. Typically, online notices that credit cards are not working for whatever reason almost invariably result in requests by the alleged vendor for credit card numbers and other PII from the customer. All of these scenarios can be manipulated in ways that stratify the class based on their choices and can be a setting for other experimental economics exercises that illustrate elements of our law classes.

IV. Conclusion

In our view, experimental economics is an ideal vehicle to expose student participants to the legal and technological risks that are present in cyberspace. Of course in addition to HIPAA regulations, there is a plethora of other consumer protection statutes and regulations that purport to protect consumer interests in cyberspace, many of which could be a setting for economic experiments.³⁵ Certainly the correspondence between what survey respondents say they do on the Internet and what they actually do could also be investigated. The behavior of respondents who say in survey answers that they are concerned about the presence or content of privacy policies, could be tracked in job search, purchasing, or online banking as to their actual behavior for which they are rewarded if they make prudent (and fortuitous) choices. Given our training with Ph.D.’s in economics we are available, within reason, to advise ALSB instructors who are interested in conducting economic experiments.

Applications of experimental economics online are limited only by the imagination of investigators. It is our experience that the use of experimental economics exercises in classes generates a lot of excitement and is a useful break from the standard lecture/note taking regimen. Furthermore, there is a lot to be learned when designing economic experiments.

³⁵ The FTC has been charged by Congress to enforce many of the consumer protection statutes where violations occur in cyberspace. The statutes enforced by the FTC can be accessed at: <http://www.ftc.gov/ogc/stats.htm>.