The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment

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Abstract

This paper analyzes a randomized experiment to shed light on the role of information and social interactions in employees' decisions to enroll in a Tax Deferred Account (TDA) retirement plan within a large university. The experiment encouraged a random sample of employees in a subset of departments to attend a benefits information fair organized by the university, by promising a monetary reward for attendance. The experiment multiplied by more than 5 the attendance rate of these treated individuals (relative to controls), and tripled that of untreated individuals within departments where some individuals were treated. TDA enrollment 5 and 11 months after the fair was significantly higher in departments where some individuals were treated than in departments where nobody was treated. However, the effect on TDA enrollment is almost as large for individuals in treated departments who did not receive the encouragement as for those who did. We provide three interpretations, differential treatment effects, social network effects, and motivational reward effects, to account for these results. (*JEL* D83, I22)

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1 Introduction

Low levels of savings in the United States have generated substantial interest in the question of what determines savings decisions. A vast literature has studied the impact of Tax Deferred Accounts (hereafter, TDA), such as Individual Retirement Accounts (IRAs) and 401(k)s, on retirement savings decisions,[1] and, concurrently, the impact of these plans' features on enrollment and contribution rates. In addition to the tax savings and economic incentives (such as employer's match), a number of recent studies emphasize the role of non-economic factors, such as social interactions, financial education, inertia, and commitment. Duflo and Saez (2002) study how individual participation in a TDA plan within a large university is affected by average participation in one's department. They obtain suggestive evidence that peer effects have a strong influence on the decision to enroll in TDA plans. Madrian and Shea (2001) and Choi et al. (2001a, 2001b) show that default rules have an enormous impact on employees' participation, contribution, and asset allocation. When employees are enrolled by default in a TDA, very few opt out and most employees do not change the default contribution rate or the default allocation of assets. Thaler and Benartzi (2001) show that inducing employees to commit to contribute a large fraction of their pay raises to the TDA (the "Save More Tomorrow" program) has a dramatic positive impact on savings rates. Bernheim and Garrett (1996), Bayer, Bernheim, and Scholz (1996), and Bernheim, Garrett and Maki (1997), among others, study the role of financial education. They present evidence that financial education tends to be remedial[2] but that it increases participation in savings plans, suggesting that employees may not be able to gather the necessary information on their own. This evidence, though suggestive, does not provide fully convincing proof that information and financial education can have a strong impact on TDA participation decisions, because the employers' decision to provide this information is endogenous. Recently, Madrian and Shea (2002) studied the effects of benefits seminars within a large firm and showed interesting evidence of self-selection in the decision to attend benefits fairs: employees who attend seminars are much more likely to be recent enrollees in the TDA

[1] See Poterba, Venti and Wise (1996) and Engen, Gale and Scholz (1996) for a controversial debate summarizing the literature.

[2] Employers resort to it when they fail discrimination testing because the contribution rates of the not-highly-compensated employees are too low.

plan. They found modest positive effect of information seminars on TDA participation after a few months.

Financial education is generally recognized as a potentially important avenue to improve the quality of financial decision making. A telephone survey we conducted with all Fortune 500 companies revealed that 71% of these companies systematically hold financial information sessions. A further 10% conducts them occasionally. The U.S. Treasury (Summers, 2000) outlined a proposal to improve financial literacy and increase the access to financial services of lower income American households. In particular, the report stressed the importance of information on savings instruments and the role of social interaction effects in the decision to save. The goal of this paper is to analyze the evidence from a random experiment to shed light on both the role of information and social interactions on the employees' decision to enroll in the employer sponsored TDA plan of a large university. Our analysis improves upon the studies discussed above because the source of identification comes directly from the randomized experiment. This allows us to overcome some of the very difficult identification problems in the presence of peer effects, described notably in Manski (1993, 1995).[3]

Each year, the university organizes and invites all of its employees to a benefits fair in order to provide information on benefits. In particular, a stated goal of the fair is to increase the enrollment rate in TDA, which the university administration feels is too low (around 35%). Obviously, comparing the TDA enrollment decisions of fair attendees to those who did not attend the fair would not provide convincing evidence of a causal effect of fair attendance on TDA enrollment, because the decision to attend the fair is endogenous.[4] To circumvent this selection problem, we have implemented the following experiment. We selected a random

[3]In spite of these difficulties, there is a growing empirical literature on peer effects using observational analysis which essentially focuses on social behavior and the adoption of new technologies. For example, Case and Katz (1991) and Evans, Oates and Schwab (1992) on teenagers' behavior, Bertrand, Mullainathan and Luttner (2000) on welfare participation, Munshi (2000a) on contraception, and Besley and Case (1994), Foster and Rosenzweig (1995) and Munshi (2000b) on technology adoption in developing countries. Sorensen (2001) analyzes peer effects within departments of a university in the choice of Employer sponsored Health Plans using a methodology related to Duflo and Saez (2002).

[4]For example, individuals who had already decided to enroll, but are not sure exactly how much they wanted to contribute, may be more likely to attend the fair. Ssee Madrian and Shea (2002) for evidence of selection in the decision to attend information sessions.

sample of employees not yet enrolled in the TDA and sent them an invitation letter promising a $20 reward for attending the fair. This type of experiment is a classical encouragement design, often used in medical science, where treatments are offered to a random group of patients who then decide whether or not to take the treatment.[5] Encouragement designs are less frequent in economics, but one such an example is the study by Powers and Swinton (1984) who analyze the effect of hours of study on test scores by randomly mailing test preparation materials to students to encourage them to study.

The second objective of our study is to analyze peer effects within departments. We therefore designed our experiment such that we are able to estimate social interaction effects. Namely, "treated" individuals who were sent the invitation letter were selected from a random subset of departments (the "treated" departments). A number of recent studies have also used experimental or quasi-experimental situations to study social interaction effects. Kremer and Miguel (2001) is perhaps the most closely related to our study. They analyze an experimental design to evaluate direct and spillover effects of a medical treatment for intestinal worms for children in schools in Kenya, and obtain evidence of spillover effects. They show that children in treated schools who did not get the medicine were also positively affected. However, in their case, variation in treatment status within a school was not randomized but occurred because some children were not present on treatment day. Katz et al. (2001) evaluate a randomly assigned housing voucher program whereby households living in high poverty public housing projects were given the opportunity to move out of the project. They find that those who received the vouchers showed an improvement in safety, health, and exposure to crime.[6] Sacerdote (2001) uses random assignment of first-year students in Dartmouth's college dorms and finds peer effects strongly influence levels of academic effort as well as decisions to join social groups. These latter two studies on social interactions differ from ours mainly because they study the effect of assigning individuals to different peer groups, whereas in our study, peer groups (departments) are fixed, and we analyze how individual decisions are affected by an exogenous change on the information

[5]For example, Permutt and Hebel (1989) study the effect of maternal smoking on birth weight using randomly assigned free smoker's counseling to encourage mothers to quit smoking. Imbens et al. (2000) analyze of the effect of flu shots (recommended but not required) to a random subset of patients on flu outcomes.

[6]Following our previous discussion, the voucher program can be seen as an encouragement design to leave public housing projects.

set of some members of the peer group.

The first stage of our study analyzes the effect of the invitation letter on fair attendance. Treated individuals are more than five times as likely to attend the fair as control individuals. Interestingly, non-treated individuals in treated departments are three times as likely to attend the fair as control individuals in non-treated departments, despite the fact that only original letter recipients could claim the $20 reward. This shows that the invitation letters not only increased the fair attendance rate for individuals who received them but also had a spill-over social effect on their colleagues within departments.

The second stage of the study tries to estimate the causal effect of fair attendance and social effects on the decision to enroll in the TDA. We show that, at 5 and 11 months after the fair, individuals in treated departments are significantly more likely to have started contributing to the TDA than control individuals. This shows that our experiment, and hence the fair, was successful in increasing TDA enrollment. However, there is no significant difference in TDA enrollment between those who actually received our encouragement letter and those in the same departments who did not. We propose three different interpretations, not necessarily mutually exclusive, to account for these facts. First, this could be explained by social effects at the department level: Fair attendees might be able to spread information obtained from the fair in their departments. However, this is not the only possible explanation. This could also be explained by differential treatment effects: Employees who come to the fair only because of the financial reward are different from those who decide to come to the fair because of their colleagues, and it is plausible to think that the treatment effect is larger for the latter group than for the former. Finally, our results might also be explained by motivational reward effects. Paying individuals to attend the fair might affect their subjective motivation and therefore the perceived value or quality of the information they obtain at the fair. Our experiment does not allow us to separately identify these three effects but it allows us to conclude that the important decision about how much to save for retirement can be affected by small shocks such as a very small financial reward and/or the influence of peers, and thus does not seem to be the consequence of an elaborate decision process.

The remainder of the paper is organized as follows. Section 2 describes the benefits fair and the design of our experiment. Section 3 discusses the reduced form evidence. Section 4 develops

a simple model to guide the subsequent analysis of our results. Section 5 provides additional evidence from a follow-up questionnaire and a general interpretation of our results. Finally, Section 6 offers a brief conclusion.

2 Context and Experiment Design

2.1 Benefits and the Benefits Fair

The university we study has approximately 12,500 employees. About a quarter of the employees are faculty members. Our study was limited to non-faculty employees only.[7] The university provides retirement benefits to its employees through a traditional pension plan and a complementary Tax Deferred Account (TDA) plan. Part of the traditional pension plan is a Defined Contribution (DC) plan whereby 3.5% of an employee's salary is put into an individual mutual fund account.[8] Employees can also voluntary contribute to a TDA 403(b) plan.[9] Every employee can contribute to the 403(b) plan any percentage of their salary up to the IRS limit ($10,500 per year for each individual in 2001). The university does not match contributions. In both the DC and the TDA plans, employees can choose to invest their contributions in any combination of four different vendors.

Each year, the university organizes a benefits fair where all employees are invited to come and learn about the different kinds of benefits (such as health benefits, retirement benefits, etc.) provided by the university. The fair is held on two consecutive days in early November in two different locations, each one close to the two separate main university campuses. About one week before the fair, every employee receives a letter through the university mail system inviting her to attend the fair. This letter also provides a brief description of the event. At the same time, under separate cover, every employee receives a packet describing in detail university benefits along with enrollment forms. November is "open enrollment" month during which each employee may change her benefits choices by submitting the enrollment form. If the employee

[7] Duflo and Saez (2002) present suggestive evidence that staff employees TDA choices are not influenced by faculty choices and vice-versa.

[8] Non-faculty employees have an additional Defined Benefits plan in addition to the DC plan.

[9] 403(b) plans are very similar to the better known 401(k) plans but their use is restricted to not-for-profits firms.

does not send back the form, her benefits choices are automatically carried over from the previous year. However, employees are free to enroll in the TDA or change their contribution level or investment decision at any time throughout the year.

In both locations, the fair is held in a large hotel reception room. There are a large number of stands representing the university Benefits Office, and the various health and retirement benefits service providers. The university Benefits Office offers information on all benefits through direct conversation with Benefits Office staff present at the fair, and through a number of information pamphlets freely available at their stand. The benefits office also provides information on how the other stands at the fair are organized. These other stands are run by each of the specialized service providers. For example, each of the mutual fund vendors has a stand at which they provide information about the TDA plan and the specific services they offer within that plan. The fair also offers individuals the chance to use a specially designed computer program to analyze their specific situation. Employees are free to come any time during the three and a half hours during which the fair is held, and visit any number of stands they want.

2.2 Experiment Design

The university organizes the annual fair in order to disseminate information about benefits and help its employees make better decisions. The university feels the participation rate among staff (34%) is too low compared to other universities, and that this may be due to lack of information.

A simple comparison between the benefits choices of those who attend the fair and those who do not does not provide an unbiased estimate of the effect of the fair. Clearly, those who plan to change their benefits choices may be more likely to attend the fair. Therefore, in order to identify the causal effect of fair attendance on TDA enrollment, we set up an "encouragement design", by promising a random subset of employees a small amount of money for attending the fair. In order to shed light on social effects within departments, not all individuals within the treated departments received a letter. There are thus two distinct treatments in our experiment: receiving the letter, and being in the same department as someone who receives a letter. By construction, all of those who received a letter are also in departments where other people received a letter as well.

We used a cross-section of administrative data provided by the university on all its employees

as of August, 2000. We restricted the sample to staff employees (i.e., non-faculty employees) aged less than 65 and eligible to participate in the TDA.[10] Of the 9,700 employees meeting these criteria, around 3,500 were enrolled in the TDA as of August, 2000. From now on, we refer to these individuals as the pre-enrolled individuals. The remaining 6,200 individuals were not enrolled in the TDA by August, 2000. As very few employees stop contributing to the TDA once they are enrolled,[11] we focus on the decision to start participating into the TDA. Thus the sample of 6,200 non-enrolled individuals is our sample of primary interest.

In the first step, we randomly selected two thirds of the departments of the university (220 out of a total of 330) as follows. In order to maximize the power of the experiment (in a context in which we know there are strong department effects), we first matched departments according to their size (i.e., number of employees) and participation rate in the TDA before the fair. We separated department into deciles of participation rates among the staff. Each decile contains 33 departments. We then ranked them by size within each decile, and formed groups of three departments by putting three consecutive departments on these lists in the same triplet. Within each of these triplets, we randomly selected two departments to be part of the group of treated departments. From now on, we denote by the dummy variable D the treatment status of departments. $D = 1$ in treated departments, and $D = 0$ in control departments.

In the second step, within each of the treated departments, any individual not enrolled as of August 2000, was selected with a probability of one-half.[12] This treatment group is composed of 2,039 individuals. From now on, we denote by the dummy variable L the selection status of individuals. We refer to this group as the Treated individuals and denote them by 11 ($D = 1$ for Treated department and $L = 1$ for being selected). The group formed by the employees in the treated departments who were not selected contains 2,129 individuals and is denoted by 10 ($D = 1$ for Treated department and $L = 0$ for not being selected). In total, there are 4,168 individuals in the treated departments. The control group is formed by employees in the control departments where no treatments were selected; it contains 2,043 individuals and is denoted by

[10] Part-time employees working less than 20 hours per week are not eligible for the TDA. Most of these employees are students of the university.

[11] Only 80 of the 3,500 employees enrolled in the TDA stopped contributing during the one year period we examine. More than five times as many employees started contributing to the TDA during the same period.

[12] This selection probability is independent across individuals.

00 ($D = 0$ and $L = 0$).

One week before the fair, we sent a letter via university mail to the 2,039 employees in the treatment group 11. The letter reminded them of the fair and informed them that they would receive a check for $20 from us if they were to come to the fair and register at our desk. This letter is reproduced in facsimile in the appendix.

At the fair, we set up a stand for the employees who received our invitation letter to register their name. Unfortunately, the Benefits Office did not authorize us to record the names of the fair participants who did not receive our letter. However, we recorded their total number: a student stood at the fair entrance and distributed a coupon to each person who entered the hall. The coupons had different colors according to the status of the participant (active or retired), which allowed us to count the number of active employees who attended the fair. Everybody had to pass through the narrow entrance to enter the fair, and the few people who refused the coupon were carefully counted. We are thus confident that we accurately recorded the number of participants. In order to collect information on the TDA status and the department affiliation of all the fair participants, we organized a raffle. The coupons that were distributed at the entrance of the fair had two parts, with a number written twice. Each fair attendant who wanted to participate in the raffle gave us half of the coupon. We asked all the raffle participants their department affiliation and whether they were currently enrolled in the TDA. The raffle was held every 30 minutes, and the prize was a $50 Macy's gift certificate. A total of 1,617 active employees attended the fair. 573 of them had received our letter. Out of the remaining 1,044 employees, 766 (i.e., about three quarters) came to play the raffle and registered their department affiliation and TDA enrollment status. An important issue that arises is whether there was selection by $D = 1$ versus $D = 0$ departments in who decided to play the raffle (and hence provide their department affiliation and TDA status). We do not believe this was the case: Most of those who refused to play the raffle did so because they visited our stand just after the previous raffle had been played, and did not want to stay at the fair long enough to wait for the next raffle. Therefore, we assume that fair attendants who did not register their department affiliation are distributed between $D = 1$ and $D = 0$ departments as those who did register. Therefore, in what follows, we scale up the attendance recorded in each department by

a factor of $1,044/766$.[13]

In order to assess the effects of the experiment and the fair on TDA participation, the university provided us with three waves of data. The first wave was obtained in September, 2000, just before the fair. The second wave was from March, 2001 (4.5 months after the fair), and the third wave from October, 2001 (11 months after the fair).

Finally, we sent a short questionnaire (reproduced in the appendix) to 917 employees in April, 2001. The questionnaire was designed to assess the intentions and evaluate the knowledge of employees about retirement benefits. An additional goal of sending out the questionnaire was to remind those that were not yet enrolled of their TDA status, and (potentially) provide them a cue to think about enrolling in the TDA. In the questionnaire, we asked employees whether they were enrolled in the TDA, why they were not enrolled, whether they saved for retirement through other means, and whether they had attended the fair. In order to induce employees to send back the questionnaire, we promised a $10 Macy's gift certificate to any employee who would send back the questionnaire within 6 weeks. We selected 917 employees to receive the questionnaire as follows. First, we restricted the sample to those who were not enrolled in the TDA by March, 2001. Second, one third of employees (301) were selected among the 573 fair participants who did receive the invitation letter. The second third (311) of employees were selected among the 1,499 employees who received the invitation letter but did not come to the fair. The last third (305) were selected among our control group $L = 0$ (those who did not receive the invitation letter).[14] We did not intentionally leave out any departments, but as the number of questionnaires was not very large, there are a number of departments where we did not send any questionnaire.[15]

3 Results: Summary Statistics and Reduced Form Differences

In the presence of social interactions, employees who work in departments where some people received the letter can be affected by the experiment even if they did not receive the letter

[13] We present in Section 5 evidence supporting our non-selection hypothesis. However, we will discuss how modifying this assumption would affect our results.

[14] Out of these 305 individuals, 160 are from the group 10 and 145 are from the control group 00.

[15] These departments tend to be smaller, but once we control for the dummy indicating in which triplet the department belongs, the difference in size is small.

themselves. They may be more likely to come to the fair themselves, because they are reminded by others of the event, or because employees come to the fair in groups.[16] They may also be more likely to enroll in the TDA even if they do not come to the fair themselves, either because they are directly influenced by the action of those who went to the fair, or because these individuals share the information they gathered at the fair. Thus, employees are potentially subjected to two kinds of treatments: They can receive the invitation letter themselves (group 11), or they can be in a department where some employees received the letter (group 10 and group 11). Those who receive the letter are, obviously, subject to both treatments.

The summary statistics are displayed in Table 1, broken down into 4 groups. In columns (1) to (3), we present the statistics for individuals who belong to treated departments. Column (1) has the statistics for the entire group (group $D = 1$), column (2) has the statistics for the group of treated individuals (group 11), and column (3) has the statistics for the untreated individuals in treated departments (group 10). In column (4), we present the statistics for individuals who belong to the untreated departments (group 00).[17]

Panel A presents background characteristics. In the first wave (in September, 2000, before the fair), a very small proportion of employees started contributing to the TDA (the first wave is from September, 2000, but we used data from August, 2000, to construct the randomization), but there is no apparent difference across groups in these proportions. Since we are interested in changes caused by the fair, we focus in the remainder of the analysis on individuals who were still not enrolled in the first wave (i.e., by September, 2000). Because the groups were chosen randomly, the mean of observable characteristics such as sex, years of service, annual salary, and age, are very similar across groups and none of the differences are significant.

In Panel B, we can see that our inducement strategy had a dramatic effect on the probability of attending the fair: In treated departments, as many as 21.4% of individuals attended the fair. In control departments, fewer than 5% of individuals attended the fair. Comparing treated individuals versus controls in the treated departments in columns (2) and (3) shows that social effects account for a large fraction of the effect of our experiment on fair attendance. The fair attendance rate of those who received our letter is 28%, and is 15.1% for those in the treated

[16] This is something we observed at the fair.

[17] It is important to note that all these statistics (except the first row of Panel A and the second row of Panel B) focus only on individuals not enrolled in the TDA on September, 2000, before the fair.

departments who did not receive the letter. Thus, the difference in the attendance rate between the 10 group and the group 00 (which is solely due to social effects) is over 10 percentage points.[18]

In Panel C, we look at TDA participation. After 4.5 months, relatively few people have enrolled. However, employees in treated departments are already significantly more likely to be enrolled than employees in control departments (4.9% versus 4%). However, individuals in group 11 are not more likely to be enrolled than individuals in group 10. The difference between groups 10 and 00 is relatively large at 1.3 percentage points. Eleven months after the fair, enrollment is higher still, and the difference between treated departments and control departments is 1.4 percentage points. The difference between groups 11 and 10 is now positive, but still very small and insignificant. The difference between group $D = 1$ and group $D = 0$ remains equal to 1.3 percentage points.

In order to analyze the differences, we consider simple reduced form regression specifications. Denote respectively by f_{ij} and y_{ij} the fair attendance and the TDA enrollment decisions of individual i in department j. Similarly, L_{ij} is the dummy for receiving the inducement letter and D_j the treatment status of the department. The average effects on fair attendance and TDA enrollment of being in a treated department ($D = 1$) versus a control department ($D = 0$) (irrespective of individual treatment status L) are captured by the following specifications:

$$f_{ij} = \alpha_1 + \beta_1 D_j + \epsilon_{ij}, \tag{1}$$

and

$$y_{ij} = \alpha_2 + \beta_2 D_j + \eta_{ij}. \tag{2}$$

The estimates for β_1 and β_2 are reported on Panel A of Table 2 for fair attendance, [column (1)], and TDA enrollment after 4.5 months [column (2)] and 11 months [column (3)]. These estimates correspond to the difference in fair attendance and TDA enrollment between treated and untreated departments reported in columns (1) and (4) of Table 1 respectively. The regressions

[18]This result is, of course, sensitive to the assumption we made about department affiliation of fair attendants who did not register at our desk. If we make the extreme assumption that all non-registered individuals come from $D = 0$ departments, the fair participation rate for group 10 would drop to 11% but still be higher than for group 00 (which would go up to 9%). In addition, we show below that the increase in fair attendance in the group 10 is parallelled by an increase in their TDA participation.

also include fixed-effects for the stratification triplet (see Section 2), and corrected standard errors for clustering at the department level.[19] Being in a treated department increases the probability of attending the fair by 16.4 percentage points. It also increases significantly the TDA enrollment rate by 0.97 and 1.41 percentage points (after 4.5 and 11 months).

Obtaining significant differences between these randomly chosen groups means that our experiment did have an impact on TDA enrollment. This impact is large in relative terms (an increase of 24% and 19% in the likelihood of enrollment after 4.5 and 11 months). However, because people update their TDA status very infrequently, it is small in absolute terms (an increase of only 1.5% points of enrollment, on a base of 36%). This effect is tiny compared to interventions that change the default rules for TDA enrollment (such as in Madrian and Shea, 2001, and Choi et al., 2001a; 2001b) or that offer individuals the option to allocate automatically future pay raises to TDA contributions (Thaler and Benartzi, 2001).

In order to separately estimate the effect of receiving the letter personally and that of just being in a department where some colleagues received the letter, we run the following reduced form regressions:

$$f_{ij} = \alpha_1 + \mu_1 L_{ij} + \delta_1 D_j + \epsilon_{ij}, \tag{3}$$

and

$$y_{ij} = \alpha_2 + \mu_2 L_{ij} + \delta_2 D_j + \eta_{ij}. \tag{4}$$

The results of these regressions are reported on Panel B of Table 2. The parameters μ_1 and μ_2 capture the difference in fair attendance and TDA enrollment between groups 11 and 10 [columns (2) and (3) of Table 1]. The parameters δ_1 and δ_2 capture the difference in fair attendance and TDA enrollment between groups 10 and 00 [columns (3) and (4) of Table 1]. Consistent with the results from Table 1, receiving the letter increases the probability of attendance by 13.1 percentage points and being in a treated department increases it by 10 percentage points. These results suggest that the promise of the $20 reward did have a strong impact on the decision to attend the fair. Moreover, the fact that colleagues received the letter also increased one's probability of attending. These peer effects can be explained in two ways. First, an employee who sees colleagues receiving the inducement letter might be reminded of the fair and be led

[19] Adding the triplet dummies reduces the standard errors, by absorbing some unexplained differences across departments of similar sizes and pre-fair TDA enrollment rates.

to think that this is an important event (worth rewarding employees for attending) and thus might decide to attend herself.[20] Second, individuals who receive the letter and decide to go to the fair might ask their colleagues to join them. Our experiment does not allow us to separate these two effects but does allow us to conclude that social interactions play an important role in the decision to attend the fair.

Columns (2) and (3) of Table 2 show that receiving the letter does not increase the probability of enrolling in the TDA (the effect is slightly negative but insignificant after 4.5 months and slightly positive but insignificant as well after 11 months), while being in a treated department does increase significantly the probability of TDA enrollment (by 1.27 and 1.3 percentage points after 4.5 and 11 months). The next section presents simple models to interpret these results.

4 Estimating the Effects of the Experiment

4.1 The Model

We posit the following simple specification to explain the effect of the experiment on TDA enrollment:

$$y_{ij} = \alpha + \gamma_i f_{ij} + \Gamma \cdot D_j + u_{ij}. \tag{5}$$

This equation states that an individual's decision to participate in the TDA is potentially influenced by their own attendance at the fair as well as by whether some colleagues received inducement letters (treatment department dummy D). The effect of being in a treated department could be direct (when many people go to the fair, their colleagues feel compelled to go to the fair as well, and to enroll in the TDA), channelled through conventional peer effects (higher fair attendance in a department leads to higher TDA participation, which in turn influences the participation of others), or resulting from the diffusion of the information obtained at the fair. Here again, these effects cannot be separately identified, and we will make no attempt to separate them.

The individual fair effect γ_i may vary across individuals in our sample, for at least two reasons. First, the effect of attending the fair on TDA participation could vary across individuals:

[20] One may also have expected the opposite effect, "if my colleagues need to be offered to be rewarded for attending the fair, it must really be uninteresting...," etc.

For some people, lack of information is not the reason why they are not enrolled in the TDA (for example, some people may be genuinely liquidity-constrained). Therefore, one would expect no effect of the experiment on them. In addition, at the fair, since individuals may choose where to go, some people may gather more useful information than others. In particular, our experiment induced two distinct groups of individuals to attend the fair: Those who were in treated departments ($D = 1$), and those who in addition to being in a treated department, received the inducement letter themselves ($D = 1$, $L = 1$). As we discuss below, the effect of the fair may be different for these two groups.

Second, it is conceivable that, even for an individual who would have come to the fair with no external inducement, receiving the letter offering the $20 reward affects the fair effectiveness. Because the individual is now paid to attend the fair, she might convince herself that she is coming just for the $20 and thus that she is not really interested in the content of the fair. This type of effect is not standard in economic models but there is substantial evidence in the psychology literature on the motivational consequences of rewards. This literature is summarized in Ross and Nisbett (1991, pp. 65-67). Festinger and Carlsmith (1959) and Cooper, Zanna and Taves (1978) showed that providing people with small financial incentives for acting as if they hold a given belief promotes greater change in the "rewarded" direction than providing them with large incentives. Perhaps most closely related to our setting, Lepper, Greene and Nisbett (1973) showed that school children who are rewarded for playing with magic markers are less likely to enjoy it than children who are not, as if "play" had subjectively turned into "work". This motivational reward effect can be captured by assuming that the treatment effect γ_i is potentially (negatively) correlated with the letter treatment L_{ij}. In order to simplify the presentation, let us assume that γ_i takes the following simple form:

$$\gamma_i = \gamma_i^S - \nu L_{ij}, \tag{6}$$

where γ_i^S (the standard treatment effect component) is independent of L_{ij}, and ν represents the motivational reward effect. Assuming no motivational reward effect amounts to simply assuming that $\nu = 0$ and thus that γ_i is independent of L_{ij}.

Each individual belongs to one of the groups 11, 10, or 00. In order to define treatment effects of fair attendance on TDA enrollment, it is useful to introduce the notion of potential outcomes for fair attendance. For each individual, we denote by $f_{ij}(11)$, $f_{ij}(10)$, and $f_{ij}(00)$

the fair attendance decision of individual i, had he been in group 11, 10, or 00. Obviously, for each individual ij, we observe only one of the three potential outcomes for fair attendance. As the literature on differential treatment effects has recognized (see Imbens and Angrist, 1994), in order to be able to identify parameters of interest, we need to make the following assumption:

Assumption 1 *Monotonicity assumption: For each individual i,* $f_{ij}(11) \geq f_{ij}(10) \geq f_{ij}(00)$.

This assumption states that receiving the letter can only encourage an individual to attend the fair (and in no case deter them), and that having one's colleagues receive the letter can also only encourage an individual to attend the fair. This assumption sounds very plausible in the situation we analyze. The Monotonicity assumption implies that the population can be partitioned into four different types.

First, the *never takers* are individuals such that $f_{ij}(11) = f_{ij}(10) = f_{ij}(00) = 0$. These individuals would not attend regardless of the group to which they belong. Second, we define the *financial reward compliers* type as individuals such that $f_{ij}(11) = 1 > f_{ij}(10) = f_{ij}(00) = 0$. These individuals attend the fair only if they receive the letter with the financial reward promise. Third, we define the *social interaction compliers* as individuals such that $f_{ij}(11) = f_{ij}(10) = 1 > f_{ij}(00) = 0$. These individuals would not attend the fair if nobody in their department receives the letter, but attend the fair if they are in a treated department (whether or not they themselves receive the letter). Finally, we define the *always takers* as individuals such that $f_{ij}(11) = f_{ij}(10) = f_{ij}(00) = 1$. These individuals attend the fair regardless of the group to which they belong.

We make the following additional assumption.

Assumption 2 *Exclusion restriction assumption:* u_{ij} *is independent of* L_{ij} *and* D_j

The assumption that the error term u_{ij} is independent of the letter assignment status L_{ij} means that the letter inviting the employee to the fair has no direct effect on TDA participation decisions of those who do not attend the fair (beyond its effect on individual and departmental fair attendance).[21] Likewise, the fact that other people received the letter is assumed to have

[21] However, note that Assumption 2 does not rule out the possibility that the letter can affect the TDA status of those who attended the fair by reducing the fair's effectiveness (through the motivational reward effect described above).

no effect on TDA participation. To ensure the validity of Assumption 2, we did not mention TDA in the letters, and the letter did not contain any mention of the employee's TDA status (see the facsimile in the appendix). To assess the extent to which written communication could affect decisions, we sent the questionnaires described in Section 2, which asked detailed questions about TDA status (see appendix). There is no significant difference in TDA participation after 6 months between departments to which we sent the questionnaire and departments to which we did not (the difference is actually negative at -0.093 percentage points with a standard error of 1.3 percentage points). Within departments to which the questionnaire was sent, the difference is only 0.90 percentage points (with a standard error of 0.94 percentage points) and not statistically significant either. Therefore, the targeted questionnaire on TDA did not seem to affect individuals' participation to the TDA. It is thus plausible that, as stated in Assumption 2, a fair invitation letter does not directly affect TDA enrollment.[22]

It is now apparent that there are four parameters of interest in the model: The average treatment effect for financial reward compliers $E[\gamma_i | f_{ij}(11) - f_{ij}(10) = 1]$, the average treatment effect for social interaction compliers $E[\gamma_i | f_{ij}(10) - f_{ij}(00) = 1]$, the social network effect parameter Γ, and the motivational reward effect ν. However, our experiment provides us with only two instruments L_{ij} and D_{ij}, making it impossible to identify all four parameters. Only if we make additional assumptions about two of these four parameters can we estimate the remaining two parameters. In the next subsection, we discuss alternative sets of assumptions under which the remaining parameters of the model could be estimated. Our goal is not to claim that any particular set of assumptions is correct, but rather to explore the implications of each assumption, and to provide bounds to the different effects.

4.2 Interpretation under Alternative Identification Assumptions

Constant Treatment Effects with No Motivational Reward Effect

[22] This echoes the results in Choi et al (2001a), who sent two versions of a questionnaire to randomly selected employees, and found that employees who received a questionnaire with more questions about retirement savings were no more likely to subsequently enroll in the TDA than those who received a version without those questions. This is also evidence, of independent interest, that information conveyed through mailing may not have a great impact on financial decisions.

If there is no motivational reward effect ($\nu = 0$) and γ_i is equal to γ for all individuals, equation (5) reduces to:

$$y_{ij} = \alpha + \gamma f_{ij} + \Gamma \cdot D_j + u_{ij}. \tag{7}$$

This is a standard Instrumental Variables setup, and both parameters γ and Γ are identified. They can be obtained by an IV estimation of equation (7), using D_j and L_{ij} as instruments. These estimates are presented in Column (1) in Table 3. The results show, as we expected from Section 3, that the direct effect of fair attendance is zero while the social effect of being in a treated department is positive (and significant after 4.5 months). Being in a treated department increases the probability of enrollment by 1.7 and 1.2 percentage points (after 4.5 and 11 months respectively). Under this set of assumptions, all the effects of the experiment are channelled indirectly through the social effect. We come back in Section 5 to the plausibility of this interpretation.

No Social Network Effects

In this situation, the parameter Γ is equal to zero, and equation (5) reduces to

$$y_{ij} = \alpha + \gamma_i f_{ij} + u_{ij}. \tag{8}$$

If we assume first that there are no motivational reward effects ($\nu = 0$), then an IV regression of equation (8) using L_{ij} as an instrument for f_{ij} for the subsample of treated departments ($D_j = 1$) provides an estimate of the average treatment effect of financial incentive compliers, $E[\gamma_i | f_{ij}(11) - f_{ij}(10) = 1]$.[23] The estimates are reported on Column (2) of Table 3. As we expected, the average treatment effect for financial incentives compliers is zero and not significant. Since it is reasonable to assume that the fair does not have a *negative* effect on any individual's participation decision, the very small coefficient in column (2) (even slightly negative after 4.5 months) would imply that the treatment effect is very close to zero for *all* financial reward compliers, which seems unrealistic. This suggests that there was very likely a motivational reward effect associated with receiving the letter.

[23]Note that the presence of social effects would not bias this estimate as the social effect is assumed to be constant within departments in equation (5).

The average treatment effect for social interaction compliers $E[\gamma_i|f_{ij}(10) - f_{ij}(00) = 1]$ can be obtained by an IV regression of (8) using D_j as an instrument for f_{ij} for the subsample of individuals with no letter ($L_{ij} = 0$). Column (3) in Table 3 presents these IV estimates, for TDA enrollment 4.5 months and 11 months after the fair. The estimates are positive and significant showing that attending the fair increases the probability of enrolling by 12.5 and 13.2 percentage points after 4.5 and 11 months in this sample. The social interaction compliers are clearly not affected by the motivational reward, but may be subject to peer effects. Therefore, the IV estimates is an upper bound of the direct effect of the fair. These effects are of comparable size (slightly higher) than those estimated by Madrian and Shea (2002) in a non-experimental setup. Therefore, the IV estimates suggest a positive treatment effect on social interaction compliers, and no effect on financial reward compliers. This differential treatment effect is plausible. Those who attend because of the reward may be less interested in the fair than those who decide to attend because of their colleagues.

If we assume that there are motivational reward effects, then the estimates in Column (2) give the average treatment effect for financial reward compliers less the motivational reward effect. We cannot obtain estimates of the motivational reward effects unless we assume that, in absence of motivational reward effects, the treatment effect would be constant for both groups of compliers. In that case, all the difference between Column (3) and (2) can be attributed to motivational reward effects. The IV estimates of equation (8) in the sample of treated departments and in the sample of untreated individuals are respectively equal to:

$$\frac{\bar{y}_{11} - \bar{y}_{10}}{\bar{f}_{11} - \bar{f}_{10}} = E[\gamma_{ij}^{S}|f_{ij}(11) - f_{ij}(10) = 1] - \nu \cdot \frac{\bar{f}_{11}}{\bar{f}_{11} - \bar{f}_{10}},$$

and

$$\frac{\bar{y}_{10} - \bar{y}_{00}}{\bar{f}_{10} - \bar{f}_{00}} = E[\gamma_i|f_{ij}(10) - f_{ij}(00) = 1].$$

Using these two expressions and the estimates of $\bar{f}_{11}$, and $\bar{f}_{10}$ from Panel B in Table 1, we obtain an estimate of ν of 0.079 after 4.5 months, and 0.054 after 11 months. Under these assumptions, receiving the letter reduces the treatment effect of the fair by 63% for TDA participation after 4.5 months, and 41% for TDA participation after 11 months.

It is useful to compare the effects of fair attendance on TDA enrollment of columns (2) and (3) with the OLS effect obtained by regressing TDA enrollment on fair attendance. The OLS

estimates are reported in column (4) for the sample of individuals who received the letter.[24] The OLS coefficient after 11 months is positive and significant, and would lead the researcher to conclude that the fair increased participation by 5.2 percentage points for those who attended it. This coefficient, as expected, is biased upward by selection bias.

In column (5), we present the "naive" IV estimate that uses the letter dummy as an instrument, in the complete sample, without taking social effect into account. This estimate lies between the estimates of column (2) and column (3). The naive estimate would underestimate the overall effect of the fair (since part of the "control" group is actually treated) and overestimate the direct effect on those who received the letter. This shows the potential bias in randomized trials that ignores externalities.[25]

The distinction between differential treatment effects, social network effects, and motivational reward effects is clear conceptually but our experiment does not allow us to tell them apart. Thus, it is useful to describe what type of alternative experimental designs would be needed to separate these effects. Differential treatment effects arise in our setting because there is a first stage in our experiment where individuals decide whether or not to attend the fair. As a result, only a self-selected fraction of individuals attends the fair. Motivational reward effects arise because individuals receive a monetary payment for attending the fair.

Social network effects could be identified with the following experiment. Within a subsample of the "treated" departments, a subsample of employees would all automatically attend an information session. This could be done by making attendance a job requirement for these employees. One could then test whether the TDA participation of other employees in treated departments rises relative to that of individuals in untreated departments. Motivational reward effects could be estimated by paying people for attending an information session in a situation where everybody is supposed to attend. For example, in many firms, new hires are often invited to attend information sessions about benefits. In some departments, this information session could be presented as a normal process through which all new employees go. In other departments, attending this information session could be presented as voluntary but a financial reward could

[24] That is the only group where we have actual individual fair attendance information.

[25] Similarly, Kremer and Miguel (2001) observe that previous estimates of the impact of deworming were biased downward by the fact that the randomization was conducted at the individual level within schools, thereby ignoring externalities across pupils within schools.

be offered for attendance (large enough to induce virtually everybody to attend). If everybody attends in both cases, the average treatment effect would be expected to be the same in both groups in the absence of a motivational reward effect.[26] Evidence of differential treatment effects could potentially be obtained by using non-monetary incentives of various intensity to attend the fair. For example, some employees could be sent a letter simply reminding them of the benefits fair. Others could be sent a more pointed letter telling them that important information can be obtained at the fair. One could also use e-mails, personal phone calls or even remind them in person to attend the fair. These different encouragement designs are associated with different groups of compliers and may thus allow estimation of different fair treatment effects.

5 Interpretation and Additional Evidence

5.1 Interpretation: Why did the experiment influence TDA participation?

The striking results of the experiment are the large spillover effects at the fair attendance stage, and the fact that, despite the large remaining difference in fair attendance, there is no difference in TDA participation between the treated and untreated individuals within treated departments, while there is a significant difference in TDA participation between treated and untreated departments. As we discussed above, the first stage results are a clear indication of social effects in the decision to attend the fair, while the interpretation of the TDA participation results is more delicate: They could be due to social effects, differential treatment effects, motivational reward effects, or a combination of the three. These three different explanations have, however, a common feature. They suggest that an individual's decision to participate in the TDA is affected by small changes in the environment, and not only by the information content of the fair.

If the results can be entirely explained by social effects, they suggest very strong peer effects, compared to the direct effect of the fair. This could be true in two models. In the first model, the fair conveys useful information, but any information obtained by a fair participant is completely diffused to the entire department to which he belongs.This would explain why group 11

[26]Note that this setting would be close to the experiments carried out in the social psychology literature reviewed in Ross and Nisbett (1991).

individuals do not participate in the TDA any more than group 10 individuals ($\gamma = 0$), who in turn participate more than group 00 individuals ($\Gamma > 0$). This model has an additional testable implication: The effect of being in a treated department is entirely due to the increase in the probability that at least one member of the department attends the fair. Indeed, according to the registration data we collected at the fair, the probability that at least one department member attends the fair is much larger in treated departments (93%) than in untreated departments (55%). Thus, an implication of the model is that if, as one would expect, the difference in the probability that at least one member of the department attends the fair is larger in small departments than in large departments, the difference in TDA participation after 4.5 or 11 months between treated and control departments should also be larger within the smaller departments. Indeed, the difference between treated and untreated departments in the probability that at least one person attends the fair is 59% in the department of 81 employees or less (department size for the median employee), and 16% in the departments with more than 81 employees. However, as we show in Panel A of Table 5, the reduced form differences after 4.5 and 11 months are virtually identical in the two sets of departments. This rejects the hypothesis of complete diffusion of information.

Under the second model, when individuals see more people attending the fair (or receiving a letter inviting others to attend the fair), they are directly induced to enroll in the TDA (irrespective of what those who went to the fair learned at the fair or decided to do). Those peer effects thus do not seem to stem from a rational herd behavior in an environment where information is scarce or difficult to obtain (as in the models of Banerjee, 1992, or Bikhchandani, Hirshleifer and Welch, 1992). At the same time, there is clearly no strong social pressure to conform to the decisions of the majority regarding the TDA (as is the case, for example, in the decision of adopt contraception for Bangladeshi women, as in Munshi, 2000b).

Another explanation for the results is that the treatment effects are different for different groups of compliers: It is positive for social interaction compliers, but zero for the financial reward compliers. In Table 5, we explore various observable characteristics which may lead to variations in the effect of the treatment. Column (1) reports average fair participation in each subgroup, among those who received the letter (we know the identity of those who attended the fair only for this group). Fair participation was larger in small departments than in large

departments, and for women than for men. In columns (2) and (3), we show the difference in TDA enrollment between treated and control departments after 4.5 and 11 months, respectively. After 4.5 months, the treatment effect seems somewhat larger in departments where the participation rate before the experiment was high (Panel B) and average salaries are high (Panel D). However, after 11 months, this difference shrank (in Panel B) or disappeared (in Panel D). This suggests that it takes more time for those in departments with low initial participation and those with lower salaries to adjust their TDA participation. Panel C shows that the effects are the same for men and women. Overall, there is no evidence that treatment effects are widely different across groups defined by observables. Any differential treatment effect between financial reward and social interaction compliers is thus not attributable to observable characteristics. Of course, it could be due to an unobservable attribute uncorrelated with these observable characteristics (like interest in the benefits). More importantly, even if the results are entirely due to differential treatment effects, and social interactions take no part in explaining the second stage results, social interactions are responsible for the variation in fair attendance among the untreated individuals in treated departments. Thus, in this case as well, social network effects caused some people to take steps which ultimately led them to change their TDA participation decision.

If the results are in part explained by the motivational reward effect, this would also provide evidence that individuals' decisions are influenced by small non-economic factors: When attending the fair on their own, they are influenced by it, but are not when they have been induced to go by the $20 reward. A small perturbation in their motivation to attend the fair thus influences their final decision. Again, this suggests that individuals' process of decision making is influenced by small changes in the environment.

In summary, a common thread to all these potential explanations is that the participation decision is influenced by things other than new information about costs and benefits of the TDA. This, combined with the fact that the effect of the information fair itself was modest in absolute terms (the upper bound of the effect of the fair on the social interaction compliers, assuming no peer effects at the TDA participation stage, is an increase of 14.8 percentage points in the participation rate after 11 months), suggests that an individual's decision to participate in the TDA is not taken as the outcome of a sophisticated decision process of information gathering and

careful considerations of the alternatives. This is consistent with a growing body of evidence on retirement savings behavior, showing that individuals believe that their savings rate is too low (Choi et al., 2001a), but that their plan to increase it are rarely followed by action (Choi et al., 2001a, and Madrian and Shea, 2002), and that retirement savings decisions are characterized by very strong inertia and adherence to default rules (Madrian and Shea, 2001, and Choi et al., 2001b). Thaler and Benartzi (2001) show that savings rates increase dramatically when individuals are offered to be enrolled in a program in which they commit now to save a portion of their future increase in earnings. We now directly examine the relationship between information and decision-making in our experiment, by examining responses to a follow-up questionnaire we sent to a sample of employees. We find results consistent with the above-mentioned literature.

5.2 Follow Up Questionnaires

A follow up questionnaire sent to 917 employees after the fair included two questions designed to measure the employees' knowledge of the retirement benefits system in the university, as well as questions to elicit alternative retirement savings options available to employees and to measure the extent of procrastination.

Analysis of survey data presents an additional challenge, as the response rate to our questionnaire was less than 50%.[27] Clearly, people who respond form a selected group: For example, people who respond to the questionnaires are 8 percentage points more likely to enroll in the TDA after 6 months than those who received it but did not return the survey (the standard error is 0.017). As we have shown in Section 4.2, the questionnaire itself had no causal effect on participation: Thus this difference is entirely due to selection. Moreover, those who received the questionnaire and did not respond are less likely to enroll in the TDA after 6 months than those who did not get the questionnaire.[28] In addition, the selection seems different in treated versus control departments. The response rate in treated departments is 45% (Table 1, Panel D), while it is only 35% in control departments. It may thus not be very informative to compare the responses across samples. On the other hand, network effects within departments seem to have played an important role here too: The response rates among treated and untreated individuals

[27]This is a common problem: The survey on savings intention by Choi et al. (2001a) had a response rate of 33%.

[28]Since we have shown above that the questionnaire had no causal effect on enrollment, this is a sign of selection.

within treated departments are essentially identical. A plausible explanation is that those who had received the fair invitation letter were able to tell their colleagues that we had delivered on our promise of sending the reward. Since the response rates are the same, the assumption that the selection process is the same is reasonable. Thus, we can compare the response among treated and untreated individuals within treated departments. These responses are not representative of the population in general, but representative of the segment of the population that tends to respond to this type of questionnaire.

The results are presented in Table 5. People who answered the questionnaire are more likely to have attended the fair than people who did not: in the treated group, 43% of the respondents to the questionnaire attended (while 28% of the entire treated population attended), and in the control group, 29% of the respondents attended (compared to 15.1%). The difference in attendance (14%) is similar to the difference in fair attendance between the two groups as a whole (13.1%), which we had recorded at the fair.[29] Respondents report very high satisfaction rates with the fair. Yet, the satisfaction is significantly higher for the control group than for the treatment group (95% against 85%). This difference is almost as large as the difference in fair attendance in this sample: It suggests either that the marginal fair participant induced by our reward was less likely to find the fair useful (thus supporting the hypothesis of differential treatment effects), or that having received the letter reduces fair satisfaction (supporting the motivational reward effect hypothesis).

In Panel B, we report the response to the question "why are you not enrolled in the TDA?", for those who report that they are not enrolled (none of them are actually enrolled). They could check as many answers as were applicable. Individuals in the treatment group are less likely to report that they lack information (20% versus 31%). The difference is significant at the 10% level. They are more likely to say that they want to enroll soon, but have not found the time yet (45% versus 36%), although the t-statistic is just 1.3.[30] All the other reasons for

[29]This similarity suggests that there was no systematic bias in the way we recorded departments at the fair–even though we recorded them for only 75% of the participants.

[30]The difference is 9%, almost as large as the difference in fair participation: A simple IV regression on the probability to report that one wants to enroll on whether an individual went to the fair, using the letter as instrument, would thus give a coefficient very close to 1, which is also what Madrian and Shea (2002) obtain: Virtually all seminar attendees who were not yet enrolled in the plan were intending to enroll soon after the

not contributing are mentioned equally often in both groups. The reason "plan to enroll soon" is the single most often cited reason for not contributing in both groups. In Panel C, we match this answer with their future behavior. Actual behavior is correlated with intention (virtually nobody who did not declare that they intended to enroll did so) but falls well short of intention. Among untreated individuals, 16.7% of those who planned to enroll did so. Among treated individuals, 10% did so.[31] Thus, letter individuals are more likely to have good intentions, but are also more likely to procrastinate.

Panel D shows the answer to the question "where do you obtain information about the TDA?" Not surprisingly, those in the treatment group are more likely to say that they obtain it from the fair (and the difference, 11%, is close to the 14% difference in fair attendance). However, they are *less* likely to obtain information from the benefits fair information packet (77% versus 93%). Those two sources of information thus appear to be substitutes. The other sources of information seem to be used equally by both groups.

Panel E reports answers to the knowledge questions. The first question is whether the employee is or is not enrolled in the TDA (when we sent the letter, none of them were). Second, we asked them whether they know the number of vendors with whom their Defined Contribution (DC) benefits are invested. Employees are automatically enrolled in the DC plan and can choose to invest their contributions with four different vendors. Many employees have more than one vendor. If they do not make a choice, the benefits office randomly allocates them to one vendor.

Treatment and control groups are about as likely to know the number of vendors with whom they are contributing: 74% and 71%, respectively, ventured to answer the question, and in total 60% of each group gave the right answer.[32] However, those who received the letter are significantly less likely to report knowing their TDA status (94% versus 99%), and less likely to give the correct answer (89% versus 94%).[33] This could reflect some over-confidence on their part, since this letter was sent only to those who were not contributing. This lends some support

seminar.

[31]This is in the ballpark of other studies. Following the survey conducted by Choi et al. (2001a), 14% of those who intended to enroll in the TDA did. Following the financial education session in Madrian and Shea (2002), 14% of the attendees (who all intended to enroll) did.

[32]Those who did not answer are counted as having given the wrong answer.

[33]Incidentally, this level of misclassification underscores the importance of working with administrative data when studying TDA savings behavior.

to the motivational reward hypothesis: In this group where the fair attendance was high, the treated group has less knowledge than the group that was not directly treated.

In summary, participation in the fair did not seem to have a large impact on the information set of those who received the letter: They seem to have substituted fair attendance for individual research. In fact, they are more likely to be unsure about their actual TDA status, and to wrongly report themselves as contributing even though they are not. However, they are less likely to think that they suffer from a lack of information, and more likely to plan to enroll soon. Of course, it does not imply that the fair did not have an impact on the information set of those who went to the fair without the letter (used here as the control group).

6 Conclusion

This paper has attempted to identify the causal effects of information and social interaction on employee decisions to enroll in an employer sponsored Tax Deferred Account retirement plan.

Our encouragement strategy successfully induced treated employees to attend a benefits fair. The experimental design allowed us to demonstrate that peer effects are an important factor in determining whether employees attend the fair. In the second stage of the study, we presented evidence that individuals affected by the experiment are indeed more likely to enroll in the TDA after the fair. Interestingly, we find that the direct causal effect of fair attendance on an attendee among those whom we directly induced to attend the fair by means of a financial reward seems to be very small compared to the effect of being in a department with high fair participation. We proposed three different interpretations, differential treatment effects, social network effects, and motivational reward effects, to account for these findings. Our experiment does not allow us to distinguish unambiguously among these interpretations, thus illustrating how the analysis of a simple experiment in a social and economic context may be substantially more complicated than expected.

We are, nevertheless, able to provide an upper bound to the effect of the benefits fair on enrollment: attending the fair increases TDA participation 11 months later by a maximum of 15% (in a sample of people who were initially not enrolled). Average TDA participation after 11 months is only 7.5% in the control group (of which 5% attended the fair). Mandatory fair participation might thus produce a non-negligible increase in the enrollment flow, comparable to

the effect of introducing a 25% employer matching contribution (Choi et al., 2001a). However, it remains small compared to changing default enrollment rules (Madrian and Shea, 2001) or offering delayed enrollment, as in the "Save More Tomorrow" program (Thaler and Benartzi, 2001).

This paper also provides experimental evidence that social interactions are a powerful mechanism in the process of information acquisition (i.e., the decision to seek additional information). Individuals do not instantly learn about economic opportunities, and their informational environment has a strong effect on their economic decisions. Low household savings levels in the United States have concerned academics and policymakers. Recognizing that savings decisions are influenced by peers' savings decisions could improve our understanding of why individuals enroll in TDAs, and may provide a rationale for organizing 401(k)s through the workplace. The large effect of a small reward on fair attendance, amplified by social effects, also suggests that individuals do not optimally seek out and process information on their own. While the motivational reward effect must be addressed, encouraging employees to attend benefits fairs may be a useful complement to automatic enrollment.

Finally, this study has shown that it is relatively simple and inexpensive to carry out an experiment within a large firm to study important economic research questions. Moreover, organizational divisions within a firm provide an excellent structure in which to study the effects of social interaction in the workplace. We hope that our study will encourage this research process and induce more economists to tackle questions in labor economics using experiments. In particular, our analysis raised more questions than we were able to answer. Using results from this experiment as a first step, one could think of several alternative experimental designs that could precisely identify the effects we have described.

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Table 1: Descriptive Statistics, by groups

	Treated departments			Untreated
	All	Treated	Untreated	Departments
	(group D=1)	(group D=1,L=1)	(group D=1,L=0)	(group D=0)
	(1)	(2)	(3)	(4)
PANEL A: BACKGROUND CHARACTERISTICS				
TDA participation	0.010	0.009	0.011	0.012
before the fair (Sept. 2000)	(.0015)	(.0021)	(.0022)	(.0024)
Observations	4168	2039	2129	2043
Sex (fraction male)	0.398	0.400	0.396	0.418
	(.0076)	(.0109)	(.0107)	(.011)
Years of Service	5.898	5.864	5.930	6.008
	(.114)	(.161)	(.16)	(.157)
Annual Salary	38,547	38,807	38,297	38,213
	(304)	(438)	(422)	(416)
Age	38.3	38.4	38.2	38.7
	(.17)	(.24)	(.24)	(.24)
Observations	4126	2020	2106	2018
PANEL B: FAIR ATTENDANCE (REGISTRATION DATA)				
Fair attendance rate	0.214	0.280	0.151	0.049
among non-TDA enrollees	(.0064)	(.01)	(.0078)	(.0048)
Observations	4126	2020	2106	2018
Fair attendance rate	0.192			0.063
for all staff employes	(.0132)			(.0103)
Observations	6687			3311
PANEL C: TDA PARTICIPATION (ADMINISTRATIVE DATA)				
TDA participation rate after	0.049	0.045	0.053	0.040
4.5 months	(.0035)	(.0049)	(.0051)	(.0045)
Observations	3726	1832	1894	1861
TDA participation rate after	0.088	0.089	0.088	0.075
11 months	(.005)	(.0071)	(.007)	(.0065)
Observations	3246	1608	1638	1633
PANEL D: RESPONSE RATE TO THE ADDITIONAL QUESTIONNAIRE				
Response rate	0.452	0.440	0.464	0.352
	(.018)	(.0201)	(.0405)	(.0402)
Observations	765	612	153	142

Notes:
1-Standard errors in parentheses.
2-The first part of Panel B includes all individuals not enrolled in the TDA by September 2000. The second part includes all employes (enrolled or not in the TDA)
3-The average fair participation in the non-treated department was obtained from the registration information collected at the fair. Since only 75% of the participants registered, the participation was adjusted by a proportionality factor.
4-Demographic information and TDA participation are all obtained from administrative data

Table 2: Reduced forms estimates (OLS)

	Dependent variable		
	Fair attendance	TDA enrollment after 4.5 months	TDA enrollment after 11 months
	(1)	(2)	(3)
PANEL A: Average effect of department treatment			
Treated	0.164	0.0097	0.0141
Department Dummy D	(.012)	(.0043)	(.0063)
Observations	6144	5587	4879
PANEL B: Effect of letter and department treatments			
Letter Dummy L	0.131	-0.0060	0.0022
	(.0227)	(.0062)	(.0102)
Treated	0.100	0.0127	0.0130
Department Dummy D	(.0131)	(.0054)	(.0085)
Observations	6144	5587	4879

Notes:
1- Dependent variables are individual fair participation (column (1)), TDA enrollment 4.5 months and 11 months after the fair (columns (2) and (3))
2- Independent variable in Panel A is the department treatment dummy D
3- Independent variables in Panel B are the individual letter dummy L and the department treatment dummy D
4- All regressions control for the triplet of the department
5- Standard errors (in parentheses) are corrected for clustering at the department level

Table 3: IV Estimates of fair attendance and department effects on TDA enrollment

	Assuming constant treatment effects	Asssuming no social effects		OLS	Naïve IV
		Effect on financial incentive compliers	Effect on social interation compliers		
	(1)	(2)	(3)	(4)	(5)
PANEL A: Dependent variable: TDA participation after 4.5 months					
Fair attendance	-0.042	-0.047	0.125	0.016	0.001
	(.0436)	(.0438)	(.0513)	(.0108)	(.0264)
Treated department	0.017				
	(.0089)				
Observations	5587	3726	3755	1832	5587
PANEL B: Dependent variable TDA participation after 11 months					
Fair attendance	0.014	0.015	0.132	0.052	0.043
	(.0675)	(.0683)	(.0818)	(.0179)	(.0399)
Treated department	0.012				
	(.0142)				
Observations	4879	3246	3271	1608	4879
Sample	Entire sample	Treated departments	No letter only	Letter only	Entire sample

Notes:
1- Dependent variables are individual enrollment in the TDA 4.5 months and 11months after the fair
2- Independent variable are individual fair attendance and department treatment dummy D in column (1)
3- Independent variable is individual fair attendance in columns (2) to (5)
4- All regressions control for the triplet of the department
5- Standard errors (in parentheses) are corrected for clustering at the department level

Table 4: Fair attendance and treatment effect in different groups

		Difference Group D=1-Group D=0	
	Fair attendance among letter recipients (L=1)	TDA participation after 4.5 months	TDA participation after 11 months
	(1)	(2)	(3)
PANEL A: DEPARMENT SIZE			
Below median (81)	0.328	0.009	0.013
	(.015)	(.0071)	(.0106)
Observations	985	2797	2403
Above median (81)	0.235	0.009	0.015
	(.0132)	(.0047)	(.0079)
Observations	1035	2790	2476
PANEL B: DEPARTMENT AVERAGE PARTICIPATION IN THE TDA BEFORE THE EXPERIMENT			
Below median (34%)	0.259	0.006	0.013
	(.0134)	(.0059)	(.009)
Observations	1062	2929	2523
Above median (34%)	0.304	0.013	0.016
	(.0149)	(.0064)	(.0094)
Observations	958	2658	2356
PANEL C: GENDER			
Women	0.320	0.012	0.014
	(.0134)	(.0071)	(.0112)
Observations	1213	3298	2843
Men	0.221	0.007	0.011
	(.0146)	(.0071)	(.0086)
Observations	807	2289	2036
PANEL D: SALARY			
Below Median ($34021)	0.269	0.001	0.015
	(.0141)	(.006)	(.0088)
Observations	983	2745	2291
Above Median ($34021)	0.291	0.018	0.015
	(.0141)	(.0065)	(.0104)
Observations	1037	2842	2588

1-The sample in column 1 is composed of individuals in group 11

2-Columns 2 and 3: Regression adjusted differences in means: department were matched according to size and participation, and triplets of departments of similar contribution rate and size were formed.
The regressions control for the triplet to which the department belongs.

3-Standard errors (reported in paretheses below the coefficient) corrected for clustering at the department level

Table 5: Effect of the fair on attitudes and knowledge

	Treated departments		
	Treament (Received invitation)	Control	Difference
	(1)	(2)	(3)
A. Fair participation and impressions			
Fair participation	0.425	0.286	0.140
	(.029)	(.054)	(.064)
Observations	301	70	371
Fair satisfaction (for those who	0.849	0.950	-0.101
attended the fair	(.027)	(.05)	(.047)
B. Response to the question "Why are you currently not enrolled in the TDA?"			
Not enough information	0.200	0.306	-0.107
	(.025)	(.059)	(.063)
Cannot afford to save for retirement	0.328	0.371	-0.043
	(.029)	(.062)	(.075)
Plan to enroll soon but no time to do it yet	0.446	0.355	0.091
	(.031)	(.061)	(.07)
Other ways to save for retirement	0.220	0.242	-0.022
	(.026)	(.055)	(.063)
Observations	255	62	317
C. Enrollment 6 months after the questionnaires			
Individuals who report that	0.099	0.167	-0.067
they plan to enroll soon	(.029)	(.09)	(.096)
Individuals who did not report that	0.020	0.000	0.020
they plan to enroll	(.013)		(.01)
D. Response to the question "where do you obtain information about benefits?"			
Benefits fair	0.370	0.254	0.117
	(.028)	(.052)	(.054)
Benefits information packet	0.771	0.930	-0.158
	(.024)	(.031)	(.039)
Personal visit to the BO	0.123	0.085	0.038
	(.019)	(.033)	(.05)
Other information seminar	0.204	0.211	-0.007
	(.023)	(.049)	(.049)
Colleagues	0.252	0.310	-0.058
	(.025)	(.055)	(.053)
Family or friends	0.265	0.239	0.026
	(.026)	(.051)	(.051)
Administrative officer	0.049	0.014	0.035
	(.012)	(.014)	(.025)
Observations	300	71	371
E. Knowledge about benefits			
Reported that she knew her TDA status	0.938	0.986	-0.048
	(.014)	(.014)	(.022)
Reported that she knew the	0.738	0.714	0.024
number of vendors with which she	(.029)	(.061)	(.058)
Gave the correct answer about TDA status	0.887	0.944	-0.056
	(.018)	(.028)	(.033)
Gave the correct answer about pension plan	0.603	0.607	-0.004
	(.032)	(.066)	(.069)
Observations	235	56	291

Notes
1-All statistics are weighted by population weight
2-Standard errors of the difference corrected for clustering at the department level
3-Sample is restricted to treated deparments

October 31, 2000

Name
Line 1
Line 2
City state zip

Dear Name:

You have just received your Open Enrollment packet from the Benefits Services Group, inviting you to the Benefits Fair 2001.

The Fair will be held in two locations:

November 7, 11am–2:30pm
ADDRESS ERASED

November 8, 11am – 2:30pm
ADDRESS ERASED

This year, as part of a study (conducted jointly by the Benefits Services Group and economics researchers) to better understand the impact of the Fair on benefits choices, we are offering a reward of **$20** to 2,000 employees, just for attending the Fair. Funding for these rewards was contributed from a research grant. We selected those employees by a simple lottery, and your name was among those drawn.

In order to receive this **$20** reward, all you have to do is to come to the Fair with this letter, and give your name at the registration table that will be located in the main hall. You will receive a check within the two weeks following the Fair.

We hope that you will find the Fair helpful in making your benefits choices. However, we want to emphasize that the reward is completely independent of your benefits decisions.

Make a note of these dates (November 7 or November 8) in your calendar, and we look forward to seeing you there.

Sincerely yours,

Name of the Benefits Office
Associate Director

April 1st, 2001

Name
Line 1
Line 2
City state zip

Dear Name:

We are currently studying whether benefits fairs, along with other way of obtaining information, convey the necessary information to members of the university community.

In the context of our study, we would like to ask you a few questions about your experience in obtaining information on the university retirement plans. If you could take a few minutes to complete the questionnaire attached to this letter, your response would be greatly appreciated. Your responses will be strictly confidential and will not be used for any purpose other than the study. You may mail your responses in the envelope provided.

As a token of our appreciation, we will send you a **$10 Macy's gift certificate** when we receive the completed questionnaire. Please return the questionnaire on or before May 15.

Sincerely,

First name, Last name

Please answer the following 6 simple questions. You can check the "don't know" answer if you are not sure of an answer. Your answers will remain strictly confidential and will be used for no purpose other than this study.

(1) In addition to your Basic Retirement Account, the university makes a monthly contribution of 3.5% of your monthly salary to an Individual Investment Account(s). You decide how this contribution should be invested from a list of four investment companies.

Through how many investment companies are you currently investing this contribution?

-One….
-Two….
-Three…..
-Four……
-Don't know……

(2) The university offers a supplemental retirement plan called the Tax-Deferred Account (TDA) program. Through the TDA program, you can add to your retirement savings by contributing a portion of your salary on a pre-tax basis. You pay no taxes on these savings or the investment income until you withdraw your funds. You decide how much to contribute and the university deducts your contributions from your paycheck. You choose how to invest your savings from a wide range of funds offered by four different vendors
You are *not* automatically enrolled in the TDA program.

Are you currently enrolled in the Tax-Deferred Account (TDA)?

-Yes ….. (go to question 4)
-No …..
-Don't know……..

(3) [To be filled out only if you are not currently enrolled in the TDA]
Why are you currently not enrolled in the TDA (check all answers that apply)?

-You do not have enough information on the TDA: ……
-Right now, you cannot afford to save for your retirement: ……..
-You plan to enroll soon, but did not have the occasion to do it yet: ……
-You save for your retirement through other means: ……

(NEXT PAGE, PLEASE)

First name, last name.

(3b) If you check the last answer, which other means are you using to save for retirement:

-TDA through spouse's employer: ……..
-Individual Retirement Account (IRA): ……
-Employer provided pension plan (own): ……
-Employer provided pension plan (spouse): ……
-Other mutual funds: …….
-Other……

(4) [To be filled out by everybody]
From which of the following sources do you get information about the retirement plans (check all that apply)?

-The benefits information fair: …….
-Benefits information packet: ……
-You came in person to the Benefits office: …….
-You attended an information seminar: ……..
-Colleagues:…….
-Family or friends:……
-The Administrative Officer of your department: ……..
-None……

(5) Did you attend the benefits information fair in the fall?
-Yes: …..
-No: ……

(6) If you did, did you find it useful?
-Yes:……..
-No: ……..