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Participation and investment decisions in a retirement plan: the influence of colleagues' choices

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Abstract

This paper investigates whether peer effects play an important role in retirement savings decisions. We use individual data from employees of a large university to study whether individual decisions to enroll in a Tax Deferred Account plan sponsored by the university, and the choice of the mutual fund vendor for people who choose to enroll, are affected by the decisions of other employees in the same department. To overcome the identification problems, we divide the departments into sub-groups (along gender, status, age, and tenure lines) and we instrument the average participation of each peer group by the salary or tenure structure in this group. Our results suggest that peer effects may be an important determinant of savings decisions.

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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

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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. A number of studies attempted to assess the effect of economic incentives on individual behavior and found mixed evidence. The presence of a matching contribution from the employer has generally been found to be correlated with higher participation rates, but the level of the match rate does not seem to matter.[2] As Bernheim (1999) points out, matching also serves as a device to focus the employees' attention. This suggests that pure economic incentives are not sufficient to explain savings behavior. Recent studies emphasize the role of non-economic factors, such as financial education and inertia. Madrian and Shea (2000a) show that default rules have an enormous impact on employees' participation, contribution, and asset allocation. When they are enrolled by default in a TDA, very few employees opt out. Further, most employees do not change the default contribution rate or the default allocation of assets. Bernheim and Garrett (1996) and Bayer et al. (1996) study the role of financial education. They present evidence that financial education tends to be remedial[3] but that it increases participation in the plan, suggesting that employees may not be able to gather the necessary information on their own.

This paper contributes to this literature by studying the role of peer effects in TDA participation and decisions related to the plan. There has never been a study of peer effects on saving decisions. This is surprising, because the theoretical literature suggests at least two reasons why peers play a role in this context. First, the plans are sufficiently subtle that their advantages are not obvious to someone who has not thought carefully about it. Even when people choose to participate, they may lack the information necessary to make investment decisions. The evidence presented by Madrian and Shea (2000a) suggests that a large proportion of people do not think about these decisions at all. The literature on informational cascades (Bikhchandani et al., 1992; Banerjee, 1992; Elison and Fudenberg, 1993) provide reasons why information (correct or not) obtained from co-workers may be an important factor in deciding whether to participate and how to invest — giving rise to peer effects. Second, savings decisions may be influenced by social norms or beliefs about social norms. By observing co-workers, people can learn about the proper behavior of their social group, as emphasized by models of conformity (e.g., Bernheim, 1994): individuals may want to maintain the same consumption level as what is common in their social group.

There is a growing empirical literature on peer effects which essentially focuses

[1] See Poterba et al. (1996) and Engen et al. (1996) in a Special Issue of the *Journal of Economic Perspectives*.

[2] See, e.g., Papke (1995), Papke et al. (1993), and Kusko et al. (1994).

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

on social behavior, and the adoption of new technologies.[4] Manski (1993) provides a formal exposition of the econometric issues involved in identifying peer effects. Correlation of behavior within peer groups is not necessarily due to the fact that members of the group directly influence each other. First, members of the same group share a common environment, which may influence their behavior. Second, except when individuals are randomly assigned to a peer group, people with similar preferences tend to belong to the same group. Both of these generate a correlation between group behavior and individual behavior which does not indicate any causal relationship between the two. Finally, there may be a causal relationship between the characteristics of the peer group members and individual behavior which does not reflect either learning or conformity. For example, employees working in firms where other people are well paid may directly benefit from some of these advantages. This is what Manski (1993) calls an exogenous (or contextual) social effect.

In this paper, we ask whether the decisions of employees of a large university to enroll in the TDA plan, and the vendor they choose once enrolled, are affected by the decisions of their colleagues in the same department. We begin by presenting an intriguing example, namely the differences in participation rates among the university's libraries. Although average staff salary and experience are very similar across libraries, participation rates are very different. This correlation may be due to peer effects, although there could be other reasons for it.

In the remainder of this paper, we focus on the decisions of the administrative and support staff of the university as a whole. There are several reasons why the identification of peer effects is easier in this context than in other situations previously studied. First, the employees share a common program, centrally organized by the university. Information sessions on benefits are identical for all departments in the university. The specific department in which one works therefore does not affect the level of inputs provided by the firm to help the employees make their TDA decisions. Second, employees do not choose to work for a particular department because it made enrollment in the TDA plan easier. It is still possible for the propensity to save to be correlated within departments. For example, economists probably know more about TDA plans than physicists, and thus are more likely to participate even if we control for earnings levels. Even when we restrict our sample to the staff, we may not remove all of this correlation. Third, once we control for individual wages or tenure, the average wage or tenure in the department may not directly affect individual enrollment decisions. We follow Case and Katz (1991), and use this assumption to construct instruments for the average participation in the plan. The instruments can still be invalid if there is

[4] See, for example, Case and Katz (1991) and Evans et al. (1992) on teenagers' behavior, Sacerdote (2000) on college students' behavior and choices, Bertrand et al. (1998) 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.

a correlation between average wage (or tenure) in a department and the individual's unobserved propensity to save even after controlling for individual wage and tenure.

Fourth, presumably, individuals interact mostly with co-workers who share observable characteristics such as gender, age, or tenure. Put another way, women are more likely to talk to women, men to men, and newly hired employees to newly hired employees. Therefore, it is plausible that the relevant peer group of an individual is a sub-group of his department. We use this presumption to construct a test of whether our previous results are due to correlated or exogenous effects. We regress individual participation on average participation in his or her own sub-group and the average participation in the other sub-groups. If there is a correlation between the instruments and the error term at the department level, we would see a (spurious) positive coefficient for the average decision of the other sub-group in the department.

Lastly, we study the choice of the mutual fund vendor in addition to the participation decision. Because vendors offer similar services, we might think that employees do not feel very strongly about any one vendor, and that if some have a preference for one vendor over another, these preferences are probably not correlated within departments. If, using the aforementioned techniques, we find a positive association between the choice of vendors within sub-groups and departments, it should reinforce our confidence in the previous findings.

The remainder of the paper is organized as follows. In Section 2, we provide evidence from the university's libraries as an introductory example. Section 3 summarizes the reasons why behavior may be correlated within departments. Section 4 describes the features of the university's TDA plan and the data. In Section 5, we present the results on the participation decisions. In Section 6, we turn to the choice of vendor. We find evidence of peer effects for both participation and vendor choice. Section 7 concludes.

2. Case study: libraries

In Table 1 we present some preliminary, but suggestive, evidence. The table displays the contribution rates, salary, and tenure of the staff in the university's 11 independent libraries that are jointly administered by a central library administration.[5] Libraries differ in the number of staff members, but the composition of the staff is similar across libraries. Salary and years of services are very similar in all libraries.

However, participation rates differ substantially from one library to another. The rates vary from 0.14 to 0.73. Is there too much variance in the distribution of

[5]There are other libraries in the university that are administratively attached to specific departments, and are not part of the central library administration.

Table 1
Participation rates in the university libraries[a]

Rank by participation level (1)	Participation rate (2)	Average salary (3)	Average tenure (4)	Number of staff (5)
1	0.73	$35,900	13.2	25
2	0.50	$35,000	10.7	16
3	0.48	$36,100	11.5	29
4	0.47	$33,200	8.8	17
5	0.40	$34,300	10.1	19
6	0.36	$39,300	10.6	32
7	0.36	$29,400	8.7	13
8	0.34	$37,300	10.8	258
9	0.25	$29,000	4.9	4
10	0.24	$34,600	10.2	17
11	0.14	$31,700	9.8	7

[a] Notes: column (2) displays the participation rate in the 403(b) plan in the 11 libraries of the university library system. Columns (3) and (4) report average wages and tenure, respectively, in each library. Column (5) reports the number of employees in each library.

participation rates across libraries relative to what we would expect in the absence of correlation of behavior within libraries? Under the null hypothesis that the individual probabilities of participation are independent and given by the empirical average participation rate p over all libraries, the variance of participation rates across libraries would be equal to 0.238. However, the actual empirical variance is 0.447.[6] Using a simple bootstrap method, we find that the null hypothesis is rejected with a P-value of 0.035.[7] Alternatively, an OLS regression of individual participation on the average participation of other employees in the library leads to a coefficient of average participation (0.31) that is significant at the 10% level.

This evidence suggests that behaviors are correlated within libraries. Glaeser et al. (1996) interpret the excessive variance in crime rates across cities as evidence of peer effects. Can this evidence be interpreted as evidence of peer effects in this context as well? Let us consider other possible reasons why the participation decisions may be correlated within libraries. First, employees in different libraries may receive different information about the plan. However, all libraries share a common plan, and are administered by a common human resources department, which makes this unlikely. Second, participation rates could be correlated because employees in the same libraries share a common unobserved taste for savings. In this example, such correlation may be minimized by the fact that the central library

[6] Under the null hypothesis, the variance of the average participation, P_x, in a department with N_x employees is $p(1-p)/N_x$. Therefore, the variance of $\sqrt{N_x}P_x$ is $p(1-p)$ for all x. Empirically, $p(1-p)=0.238$ and the variance of $\sqrt{N_x}P_x$ across x is 0.447.

[7] The null hypothesis cannot be rejected, however, if we exclude the library with the largest participation rate.

administration hires new library employees. Therefore, they are not hired by different people with different preferences for high or low savings employees. In addition, initial assignment to a library seems to be mostly determined by the opening of a position suitable to the applicant at the time he or she applied, and year to year transitions from one library to another are extremely rare.[8] Therefore, it seems plausible that the assignment to a particular library is not systematically related to one's propensity to save. However, it is still possible that the tastes for savings are correlated within libraries. First, some libraries are more prestigious than others, and therefore the human resources department of the library administration may direct the most competent applicants towards those libraries (the fact that salaries and tenure do not vary much from one library to another is comforting but the staff composition may still differ along unobserved skill dimensions correlated to savings). Second, some library staff *do* have special skills or characteristics (for example, employees at the Oriental Studies Library are more likely to be Asian-Americans), which may be correlated with their propensity to save.

This evidence is therefore suggestive, but by no means definitive. In the following sections, we present evidence on the importance of peer effects on the decision to enroll in the TDA and on the choice of vendor using data from the university as a whole.

3. Interpreting the correlation of behavior within departments

Does the fact that behavior is correlated within peer groups imply that the behavior of an individual is directly influenced by its peer group? Specifically, can we use our data to answer the following two policy questions: First, if the peer group of an individual changes, will his participation decision change? Second, can savings incentives, such as matching rates, or information sessions have *multiplier* effects, that is, indirectly influence the decisions of those who were not directly affected by them? To help answering these questions, we briefly recall the reasons why behavior may be correlated within groups. This section relies heavily on Manski (1993, 1995).

The formal framework is the following. Each individual in the university is characterized by a vector (y,x,Z,u). y is the outcome of interest. In the paper we consider two outcomes. First, we study participation decisions. In that case, y is a dummy for participation in the Tax Deferred Account (TDA). Second, we study the choice of the mutual fund vendor conditional on participation.

x is the department to which the individual belongs. (Z,u) are individual characteristics that affect the outcome y. The characteristics Z are observables

[8] From a total of 1800 observations (around 450 employees in libraries observed four times over 2 years), there is only one occurrence of an employee switching from one library to another.

(salary, gender, age and years of service). u is an unobservable scalar which represents unobservable characteristics that might affect the outcome y, such as tastes for savings or for a particular vendor that are not captured by the observables. We assume a linear specification:

$$y = \alpha + \beta E(y|x) + Z\eta + u. \quad (1)$$

Eq. (1) expresses that the individual choice y is influenced by the mean of y in one's department x ($E(y|x)$), and by individual characteristics (Z,u). The parameter η captures the direct effect of observable characteristics Z on y. For example, individuals with higher salary or with more years of service are more likely to contribute to the TDA plan. The parameter β captures the peer effects or *endogenous* social effects in the terminology of Manski (1993): each individual is influenced by the average participation in its department.

However, there is another channel through which behavior may be correlated within departments: some of the unobservable characteristics which influence an individual's participation (or vendor's choice) may be correlated within a department. We capture this feature with the following expression:

$$E(u|Z,x) = U(x). \quad (2)$$

The function $U(x)$ is unknown and not restricted. Whenever $U(x)$ is not constant, an OLS regression of y on the mean of y in the department generates a non-zero coefficient. In the terminology of Manski (1993), $U(x)$ is not constant when there are either *correlated* effects or *exogenous* social effects. Let us describe in more detail the sources of correlation of behavior within groups. Columns (1) and (2) in Table 2 summarize this discussion and answer, for each source of correlation, the two questions that opened this section. First, can savings incentives (like matching rates) or information sessions have *multiplier* effects? Second, if the peer group of an individual changes, will his participation decision change?

3.1. Correlated effects

Correlated effects arise when individuals in a peer group behave similarly because they have similar unobserved characteristics or they share a common environment.

First, members of a peer group may have similar preferences. For example, faculty members in the department of economics are likely to be more informed about the advantages of TDA plans and hence more likely to participate than faculty members in the department of physics. Likewise, the assignment of staff to departments is not random. Most departments are responsible for hiring their staff members. Employees may all be similar because they have been chosen by the same person, and each person in charge of hiring may emphasize different forms of competence, some of which are quite possibly correlated with propensity to

Table 2
Sources of correlations of behaviour: consequences and identification[a]

	Consequences		Identification: positive coefficient on average outcome in department					
	Multiplier effect of intervention	Effect of changing peer group	OLS	IV	Sub-group decomposition OLS		Sub-group decomposition IV	
					Own-group	Cross-group	Own-group	Cross-group
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Correlated effects	No	No	Yes	No/yes[b]	Yes	Yes	No/yes[b]	No/yes[b]
Exogenous social effects								
Instrument has an exogenous social effect				Yes			Yes	Yes
	No	Yes	Yes		Yes	Yes		
Instrument has no exogenous social effect				No			No	No
Endogenous social effects (peer effects)								
Conformity to a norm	No	Yes						
			Yes	Yes	Yes	No	Yes	No
Learning	Yes	Yes						

[a] Notes: column (1) states whether we would observe a multiplier effect of an intervention such as improving incentives or information in the presence of correlated effects, exogenous social effects, and peer effects due to conformity or learning. Column (2) states whether we would observe an effect on behavior if the peer group of an individual changes in the presence of correlated effects, exogenous social effects, and peer effects due to conformity or learning. Columns (3) to (8) indicate, for each specification, whether we obtain a positive coefficient on the peer effect parameter β of Eq. (1) in the text as a consequence of correlated effects, exogenous social effects, and endogenous social effects. For Instrumental Variables (IV) specifications, columns (4), (7), and (8), we assume either that the instrumental variables generate exogenous social effects (top) or that they do not (bottom). For the sub-group decomposition in columns (5) to (8), it is assumed that correlated effects are in part common to the two groups, and that there are no cross-group peer effects.

[b] Correlated effects have no effect on IV estimates only if instruments are orthogonal to correlated effects (see text for caveats).

save. For example 'good' departments may hire 'competent' people, and competent people may make good financial decisions.

Second, members of a peer group share a common environment. To take an extreme example, if we compared different firms, some of them may not even offer a plan to their employees. In our case, the plan is common to all employees. However, they may still receive different information about the plan. For example, the administrative officer of each department may be more or less effective at relaying the relevant information about TDA plans to the employees.

If the correlation of participation rates within departments is entirely due to a similarity in preferences, the fact that OLS estimation of Eq. (1) leads to a positive estimate of β has no implication for policy. In particular, the behavior of a given individual will not be affected if he moves to another department or if the participation rate changes in his department for some exogenous reason. If the correlation is due to a shared feature of the environment, participation would be affected only by a modification of this feature.

3.2. Exogenous (or contextual) social effects

Exogenous social effects arise when there is a direct causal relationship between the average characteristics in the peer group and the individual outcome of interest, even after controlling for the individual's own characteristics.

For example, exogenous social effects would arise if the fact that everybody else in the department has high wages directly induces an individual to contribute to the TDA plan. Often, exogenous social effects cannot be ruled out, because the characteristics of other people in the peer group determine the level of inputs received by each individual. For example, it is likely that there is a causal link between average wages in a firm and the participation of the employees in the TDA. Employees with high wages are more likely to require and obtain a TDA plan from their firm. They are also more likely to contribute. In order to satisfy the non-discrimination test, the firm then needs to take steps to ensure that the low-paid employees contribute as well. There is therefore a causal effect of the distribution of wages in the firm on the participation of low-paid employees. In contrast, in the case of departments within a university, the plan characteristics and the discrimination testing are common across all departments. However, exogenous social effects could operate through other channels. For example, in a department where average salaries are high, the department administrator may be more likely to inform employees of the existence of the plan. Moreover, individuals could be directly influenced by the characteristics of their colleagues: for example, they may be more likely to save for retirement if their colleagues are older and closer to retirement.

Exogenous social effects imply that individuals are influenced by the background characteristics of their co-workers, but not directly by their actions. An

OLS estimation of Eq. (1) would lead to a positive coefficient β. Two individuals randomly assigned to two different departments would have different contribution rates. However, if the participation rate of some individuals changed, for example following an information session, or because they were given specific incentives, this would not affect the participation of their colleagues.

3.3. Endogenous social effects

Endogenous social effects, in the terminology of Manski, arise when the outcomes (y) of the members of the peer group have a causal effect on the outcome y for each individual. This can happen for two reasons.

First, members of a group may be sensitive to the prevalent group norm. If everyone around them save, they may want to save as well by desire of conformity (as in Bernheim, 1994). They learn about the prevalent norm through the observation of their colleagues' actions. They are then directly influenced by the action of others in the group, but only to the extent that these actions inform them about the norm. Peer effects can then be present even if individuals are perfectly informed about the characteristics of the plan. Changing incentives for some members of the group may not have any multiplier effect, since nothing has changed for the individual who is not directly affected by these incentive.

Second, they could learn about the plan from those who participate. In this case, individuals learn from each other, not about a norm, but about the best choice given their own preferences. The very fact that someone participates may convince them that participating is beneficial (as in Bikhchandani et al., 1992; Banerjee, 1992; Elison and Fudenberg, 1993), or they could be getting from participants (who have experimented) the tips that make participation beneficial (as in Foster and Rosenzweig, 1995). Financial education would have a multiplier effect in this context: a few well informed employees in a department would be able to relay the information to others. Furthermore, if individuals are making inferences from observing the actions of their peers, inducing some individuals to make the decision that would be made by a fully informed individual (by providing them specific incentives, for example) would also lead to welfare gains.[9]

In this paper, we present evidence showing that behavior is correlated within groups, and that the correlation does not seem to be fully accounted for by correlated or exogenous social effects. Our data, however, will not allow us to tell whether the effects arise out of a desire for conformity or out of learning effects. The next section presents the data. Our results on participation and vendor choice are presented in Sections 5 and 6.

[9]Note that, in these models, a few misinformed individuals can lead everybody to take the wrong decision (see notably Banerjee, 1992). The welfare effect of an informational session can then be very important.

4. Description of the TDA plan and the data

4.1. Features of the TDA plan

The university we study has approximately 12,500 employees. About a quarter of the employees are members of the faculty. The university provides retirement benefits to its employees through a traditional pension plan and a supplemental Tax Deferred Account (TDA) plan.

Part of the traditional pension plan is a Defined Contribution (DC) plan where a given percentage of an employee's salary is put into an individual mutual fund account run by the fund manager.[10] The university contributes 3.5% of salaries into this DC plan for staff employees and 5 to 10% (depending on tenure and age) for faculty. There is a 1 year waiting period for the DC plan benefit to begin.

Employees can also contribute to a TDA plan, a 403(b) plan[11] which has no waiting period. Every employee can contribute to the 403(b) plan any percentage of their salary up to the IRS limit (approximately $10,000 per year for each individual). The university does not match contributions.

In both the DC and the TDA plans, employees can choose where to invest their contributions from any number of four different vendors. Each vendor provides a large selection of mutual funds (around 40 each) that include money-market funds, bonds, and stocks (both U.S. and foreign). Each of the four vendors offer very similar services. All vendors allow customers to change their portfolios in a very flexible way through the phone or the internet. We will concentrate on the three biggest vendors which attract over 90% of total contributions.[12] We denote these three vendors R, D, and V.

4.2. Summary statistics

The university provided us with individual data on TDA participation and contributions. The university collected four waves of data (October 1997, June 1998, October 1998, and June 1999) on all the employees. Individual identifiers are provided so that the four waves can be linked. We use the four waves together and correct the standard errors for clustering at the individual level.

A number of variables are included for each employee and each wave. Table 3 provides summary statistics of the variables we use in this study. It displays means and standard deviations for three groups of employees. Column (1) is the complete sample (both staff and faculty). We exclude from this sample all employees

[10] Staff employees have an additional Defined Benefits plan in addition to the DC plan.

[11] 403(b) plans are very similar to the better known 401(k) plans but their use is restricted to not-for-profits firms.

[12] The fourth vendor represents only 6% of the contributions. The remaining 4% are spread among a few vendors which are no longer offered.

Table 3
Summary statistics[a]

	Complete sample (1)	Staff (2)	Faculty (3)
(A) General characteristics			
Number of employees, 10/97	10,668	8076	2572
Number of employees, 06/98	10,769	8100	2655
Number of employees, 10/98	10,886	8204	2668
Number of employees, 06/99	11,360	8506	2843
Salary (mean)	$48,330	$42,040	$67,610
	[31,930]	[22,398]	[46,009]
Salary (median)	$38,300	$36,573	$53,000
Gender (male)	0.45	0.37	0.72
	[0.50]	[0.49]	[0.45]
Age	41.8	40.7	45.3
	[11.7]	[11.2]	[12.7]
Tenure (years of service)	8.1	7.8	9.3
	[8.8]	[7.8]	[11.3]
(B) TDA participation and vendor choices			
Participation in the TDA plan	0.352	0.356	0.335
	[0.477]	[0.478]	[0.472]
Participation in the TDA plan when tenure <3 months	0.034	0.049	0.026
	[0.181]	[0.22]	[0.158]
Share of vendor R	0.351	0.333	0.411
	[0.455]	[0.450]	[0.479]
Share of vendor D	0.325	0.334	0.260
	[0.429]	[0.435]	[0.408]
Share of vendor V	0.221	0.221	0.221
	[0.383]	[0.374]	[0.383]
(C) Departments (in 06/99)			
Number of departments	358		
Average number of employees over departments	33.7	25.3	8.4
	[58.7]	[47.5]	[19.9]
Median number of employees	14	9	1

[a] Notes: food and custodial services excluded. Departments with one or two employees only excluded. Business school also excluded. Statistics reported in (A) and (B) are averages over the four waves. In (C), numbers reported are for the wave 06/99 only.

working in food and custodial services, because their wages and contribution levels are substantially below those in the other departments. We exclude the business school as well because we did not obtain the breakdown by departments within the school.[13] We also exclude all departments with either one or two employees. In total, these excluded observations represent slightly less than 10%

[13] As a result, the number of employees in the business school is over 700, much more than the next largest department.

of the initial sample. Because there are strong reasons to think that faculty are sorted into departments in a way that is correlated to their propensity to save, we almost entirely restrict the analysis of peer effects to non-faculty employees. Column (2) presents descriptive statistics for this sample. Since we are restricted to individuals who participate in the TDA when examining the choice of vendor, we will present results for all staff members who participate. Finally, we present the descriptive statistics for faculty in column (3).

Table 3A displays demographic and compensation characteristics of the university's employees. The average salary among staff is a little over $42,000. The percentage of male employees in the staff sample is 37%. The average age is 41 and the average tenure is 7.8 years. Table 3B presents information on TDA plan participation and choice of vendors. The average participation rate is 36% among staff. The share of contributions in vendors D, R, and V are 33, 33, and 22%, respectively. Table 3C presents information on departments. Our sample is divided into about 358 departments. The average number of employees per department is 34, and the median is 14. The median number of staff members is nine (the average is 25.3) and the median number of faculty members is only one because many departments do not have faculty employees (the average is 8.4).

5. Peer effects in participation decisions

In this section, we first show that participation rates are correlated within departments, and we then present evidence which suggests that this correlation is, at least in part, driven by social effects.

5.1. OLS results

We rewrite Eq. (1) as follows to correct for the mechanical correlation between own and average participation:

$$y_i = \alpha + \beta \hat{E}_{-i}(y|x) + Z_i\eta + u_i, \tag{3}$$

where i is an individual observation, and

$$\hat{E}_{-i}(y|x) = \sum_{j \in x \setminus \{i\}} y_j/(N_x - 1)$$

is the average of y in department x (excluding individual i). N_x denotes the number of individuals in department x.

The results of estimating this equation by OLS are presented in column (1), Table 4. We control for gender, dummies for each age decade, tenure dummies, and salary dummies indicating in which decile of the university-wide distribution of salaries the individual falls.[14] The OLS coefficient shows that, controlling for

[14]Our results are very robust to the functional form of control variables.

Table 4
OLS and 2SLS estimates[a]

	OLS	OLS highest paid	2SLS salary	2SLS tenure	2SLS tenure and salary
	(1)	(2)	(3)	(4)	(5)
Average participation in the department	0.307	0.275	0.168	0.235	0.207
	(0.032)	(0.034)	(0.082)	(0.076)	(0.059)
Highest paid employee participation dummy		0.037			
		(0.011)			
Gender (male dummy)	−0.067	−0.064	−0.067	−0.066	−0.069
	(0.009)	(0.009)	(0.010)	(0.010)	(0.009)
Age					
10 to 19	0.039	0.048	0.028	0.033	0.031
	(0.118)	(0.120)	(0.123)	(0.121)	(0.122)
20 to 29	0.071	0.082	0.063	0.067	0.065
	(0.117)	(0.117)	(0.121)	(0.119)	(0.120)
30 to 39	0.068	0.077	0.059	0.063	0.061
	(0.116)	(0.118)	(0.121)	(0.119)	(0.120)
40 to 49	0.076	0.087	0.066	0.071	0.069
	(0.116)	(0.118)	(0.121)	(0.119)	(0.120)
50 to 59	0.159	0.168	0.151	0.155	0.153
	(0.116)	(0.119)	(0.121)	(0.119)	(0.120)
60 to 69	0.212	0.223	0.202	0.207	0.205
	(0.118)	(0.120)	(0.122)	(0.120)	(0.120)
70 to 79	0.046	0.044	0.037	0.041	0.039
	(0.124)	(0.127)	(0.128)	(0.127)	(0.127)
Tenure					
Less than 1 year	−0.214	−0.214	−0.215	−0.214	−0.215
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
1 to 2 years	−0.105	−0.106	−0.106	−0.105	−0.105
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
3 to 4 years	−0.058	−0.058	−0.058	−0.058	−0.058
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
4 to 7 years	−0.024	−0.024	−0.023	−0.023	−0.023
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
7 to 12 years	0.004	0.005	0.004	0.004	0.004
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Salary decile					
Decile 1	−0.309	−0.306	−0.314	−0.312	−0.313
	(0.015)	(0.015)	(0.015)	(0.029)	(0.015)
Decile 2	−0.285	−0.281	−0.290	−0.288	−0.289
	(0.014)	(0.014)	(0.015)	(0.029)	(0.015)
Decile 3	−0.260	−0.259	−0.264	−0.262	−0.263
	(0.014)	(0.014)	(0.014)	(0.028)	(0.014)
Decile 4	−0.222	−0.220	−0.226	−0.224	−0.225
	(0.015)	(0.015)	(0.015)	(0.030)	(0.014)
Decile 5	−0.166	−0.165	−0.169	−0.168	−0.168
	(0.015)	(0.015)	(0.015)	(0.030)	(0.015)
Decile 6	−0.085	−0.083	−0.088	−0.086	−0.087
	(0.015)	(0.015)	(0.015)	(0.029)	(0.015)
Number of obs.	32,940	32,517	32,940	32,940	32,940
F-Statistic of the first stage			11.4	25.2	21.4

[a] Notes: sample restricted to staff employees. Food service and business school employees excluded. Standard errors corrected for clustering at the individual levels. In column (3), the instruments are the proportion of employees of the department whose wage falls into each decile of the university-wide distribution of wages. In column (4), the instruments are the number of employees of the department whose tenure falls into each category. In column (5), both sets are used together.

age, tenure, and salary, there is a strong correlation between individual participation decisions and average participation in the department. Each additional percentage point of participation in the department is associated with a 0.31 percentage point increase in the individual's probability of participating in the TDA. The coefficients of the control variables are reasonable: women tend to contribute more than men. Participation increases with age, tenure (especially during the first 4 years), and with wages.

If there are correlated or exogenous effects, the error term u is correlated with the variable of interest $\hat{E}_{-i}(y|x)$, and the OLS coefficient cannot be interpreted as evidence of the presence of peer effects. This discussion is summarized in Table 2, column (3). The remainder of the paper will try to address this concern with additional evidence.

Before turning to this evidence, we present in column (2) of Table 4 an interesting additional fact: we estimate a version of Eq. (3) where we include in addition a dummy indicating whether the highest paid staff member of the department contributes to the TDA (he is therefore likely to be the administrative officer) and we exclude this individual from the sample. The average participation in the department is still positive and significant, and the dummy indicating whether the highest paid member contributes is also positive and significant, indicating that he has an influence *over and above* the average participation in the department. Controlling for average participation, individual participation is 3.7 percentage point higher if he or she contributes.[15] This could be due to the fact that he or she selects employees with tastes that are similar to his or hers, or that he or she is important in relaying the information to others. If more information were available, it would be very interesting to pursue this analysis further and see whether peer effects follow the hierarchical structure within departments.

5.2. Two-stage least squares

To rule out the possibility that the correlation of behavior within departments is driven entirely by unobserved correlated characteristics, the ideal experiment would be to allocate employees randomly to departments (an example of random allocation of roommates is studied in Sacerdote, 2000), or to induce a modification of the contribution rate of a random subset of employees in some departments. One would then need to compare the participation of the non-affected employees between those departments and the departments where no intervention took place.[16]

[15] If he or she had no more influence than anyone else, the coefficient would be 0. We checked that when we regress individual participation on average participation and the participation of a random person in the department, the coefficient is zero for the participation of the random person.

[16] We will describe such an experiment in more detail in the conclusion.

In the absence of such an experiment, average exogenous characteristics of the groups could be used as instruments for the average participation (for a previous application of this strategy, see Case and Katz, 1991). As we saw in the previous subsection, tenure and wages are strong determinants of participation in the plan. Therefore, average wages and or tenure in the department are also strongly correlated with average participation. Thus $E(Z_1|x)$, where Z_1 is a set of wage and tenure variables, can potentially be used as an instrument. The F-statistic of the first stage correlation between $\hat{E}_{-i}(y|x)$ and $E(Z_1|x)$ is strong. These variables are valid instruments only if they do not directly affect the participation rates (through exogenous social effects), and if they are not correlated with the unobserved determinant of savings, two points to which we will return below.

In columns (3), (4), and (5) of Table 4, we re-estimate Eq. (1) using, respectively, the proportion of individuals in the department who fall in any given decile of the university-wide distribution, the proportion of individuals in each tenure category, and both together, as instruments for average participation. The three coefficients obtained by instrumental variables are similar, and they drop from 0.31 to between 0.17 and 0.23, which indicates that the OLS coefficient is upward biased, probably due to omitted correlated effects. The coefficient remains sizeable and significant. The effect on individual participation of raising the average participation in the department by one percentage point is larger than the effect of moving from the first to the fourth decile in the wage distribution. The similarity of the estimates obtained with the two alternative instruments is reassuring: an over-identification test does not reject the joint validity of the instruments. At the bottom of Table 4, the F-statistics of the first stage are reported. These statistics are large (between 11 and 25), showing that the instruments are significantly correlated with the participation rate in each department.[17]

These 2SLS results alone do not constitute definitive evidence, because the two conditions necessary for the validity of the wage and tenure variables as instruments may fail. First, as discussed in Section 3, there may be a direct exogenous effect of average wages or tenure in the department on an individual's participation, even after conditioning for one's wage. Second, unobserved characteristics correlated with propensity to save (e.g., 'competence') could well be correlated with the department's average wage, even after conditioning for an individual's wage. For example, professors' salaries in the well renowned departments may be higher than in other departments, and these departments may also be able to hire more competent staff. This discussion is summarized in Table 2, column (4).

A simple way to assess whether 2SLS helps to solve the problem is to replace the participation variable with age. Obviously, age cannot be affected by the age of

[17]The F-statistics are obtained by running the first stage at the department level. They are, therefore, conservative.

colleagues through peer effects. An OLS regression of individual age on average age in the department (controlling for gender and salary) produces a positive and significant coefficient. However, when average age is instrumented with average salary in the department, the coefficient is much smaller and insignificant. This suggests that the IV strategy can be successful in removing correlated effects. In the next subsection, we provide additional evidence to reinforce our confidence in these results.

5.3. Looking at sub-groups within departments

Actual peer groups are in many cases smaller than departments. This fact can be used to help identify peer effects. If peer groups are only a subset of each department, there is an a priori restriction on the pattern of peer effects: there should be no effects of the participation of members of the other sub-groups on the members of one sub-group. There are sub-groups within departments where peer effects can be expected to be stronger than for the department as a whole. For example, newly hired employees may talk more to other newly hired employees than to established employees, and vice-versa. Moreover, if established employees have already made their decisions, they are not likely to be affected by what newly hired employees do (since decisions are rarely reversed after a length of tenure). Women probably talk more to women than to men, and men more to men than to women.

Here, we follow an idea developed by Munshi (2000a) which proposes to regress individual participation for each sub-group separately on the participation in their own and in the other sub-group.[18] If there is a department-level correlated effect, it should cause the coefficient of average cross-group participation to be positive (even in the absence of peer effects). In other words we run

$$y^k = \beta^k E(y|x,k) + \gamma^k E(y|x,\bar{k}) + Z\eta^k + u^k, \tag{4}$$

where k is the sub-group within a department (we assume that each department is partitioned into two sub-groups with $\underline{k} = 0$ or $k = 1$) and y^k is the outcome of an individual in group k. We denote by $\bar{k}$ the complement of k. As before, we allow for the possibility of a correlation between u^k and x. If we believe that cross-group effects are zero (that is, the parameter γ^k is equal to 0) and that the error terms in each sub-group are correlated then we can estimate Eq. (4) by OLS or 2SLS, and test whether the estimate $\hat{\gamma}^k$ is 0.[19] If $\hat{\gamma}^k$ is different from 0, it will indicate that

[18] Bertrand et al. (1998) exploits a related idea: they study whether the number of welfare participants who speak an individual's language affect his participation, after controlling for the fraction of participation in his area of residence.

[19] The instruments are constructed as the expectation of the subset Z_1 in Z in each sub-group for each department ($E(Z_1|x,k)$).

there are correlated or exogenous effects at the departmental level, which biased our previous estimate. If $\hat{\gamma}^k$ is equal to 0, it will indicate that previous estimates were not biased by any correlated or exogenous effects that are at least in part *common* to the entire department.

There could still be a problem with the OLS version of this test: If women and men are doing different jobs, a different person could be in charge of hiring them or the same person could emphasize different skills (men and women would then in effect form two different 'departments'). The same could apply to tenure, if the person in charge of hiring had changed (although it is difficult to imagine that it would happen in all departments at the same time). However, when we combine the sub-groups and the 2SLS strategy, we would need to tell complicated stories to explain why all cross-group effects are zero. For example, when we use the salary instrument, we allow for the fact that a woman with high propensity to save would be more likely to work in a department where salaries are high. For example, if highly paid department hired high savings employees, it would still lead to a positive $\hat{\gamma}^k$, for example, unless only women were involved in the hiring of women employees, an implausible assumption. For all the sub-groups we consider, it seems reasonable to consider that an omitted departmental effect should be correlated across sub-groups within a department. Taking the results together should therefore give us a good idea of the presence of peer effects in retirement plan decisions. Note that, if the strength of the (group-specific) peer effects varies across departments, and if they are stronger in departments where participation rates are also higher (for example, because the administration both encourages interaction among employees and informs them well about the plan), the coefficient of own group in this regression will be an overestimate of the *average* influence of colleagues' choices in the university. However, the fact that we find a positive and significant coefficient on own group and a zero coefficient on cross-group participation will still indicate that peer effects are present. This discussion is summarized in Table 2, columns (5) to (8).

In Table 5 we present the results on peer effects among sub-groups. The first two columns present the results for the participation of individuals in group 1, and the last two columns present the results for the participation of individuals in group 2. In each panel, the first line displays the effect of the average participation of members of group 1 and the second line displays the effect of the average participation of members of group 2. The third line reports the *P*-value for the test that the two coefficients are equal. Columns (1) and (3) report the OLS results, columns (2) and (4) report the 2SLS results using both salary and tenure as instruments.

In Table 5A we present the effect of the average participation broken down by gender. In columns (1) and (2) of Table 5, we see that participation of the female employees is significantly affected by the average participation of other women (the OLS and IV coefficients on female participation are, respectively, 0.20 and 0.36 and all are significant) but not by that of men (the coefficients are smaller,

Table 5
Peer effects on participation decisions among sub-groups[a]

Instruments	Group 1		Group 2	
	OLS	2SLS salary tenure	OLS	2SLS salary tenure
	(1)	(2)	(3)	(4)
(A) Group 1: female (19,635 obs.) and group 2: male (11,756 obs.)				
Average participation	0.203	0.360	0.164	0.044
in group 1 (female)	(0.042)	(0.079)	(0.048)	(0.085)
Average participation	0.088	−0.099	0.128	0.294
in group 2 (male)	(0.040)	(0.069)	(0.046)	(0.088)
P-value of test coeff. differ.	0.072	0.000	0.727	0.095
(B) Group 1: tenure below 3 years (11,715 obs.) and group 2: above 7 years (13,165 obs.)				
Average participation	0.144	0.189	0.020	0.006
in group 1 (young)	(0.038)	(0.076)	(0.046)	(0.094)
Average participation	0.057	0.064	0.183	0.266
in group 2 (old)	(0.034)	(0.082)	(0.050)	(0.137)
P-value of test coeff. differ.	0.110	0.020	0.320	0.140
(C) Group 1: young (35 and below, 12,468 obs.) and group 2: old (above 36, 19,049 obs.)				
Average participation	0.246	0.411	0.044	−0.031
in group 1 (young)	(0.040)	(0.078)	(0.039)	(0.069)
Average participation	0.053	−0.093	0.277	0.344
in group 2 (old)	(0.041)	(0.081)	(0.042)	(0.080)
P-value of test coeff. differ.	0.070	0.000	0.064	0.095
(D) Group 1: staff (17,849 obs.) and group 2: faculty (9719 obs.)				
Average participation	0.219	0.401	0.000	−0.117
in group 1 (staff)	(0.059)	(0.100)	(0.048)	(0.066)
Average participation	0.010	−0.020	0.169	0.233
in group 2 (faculty)	(0.025)	(0.033)	(0.050)	(0.062)
P-value of test coeff. differ.	0.002	0.003	0.021	0.000
(E) Group 1: department and group 2: other departments in the same school (27,114 obs.)				
Average participation	0.301	0.231		
in group 1 (own department)	(0.033)	(0.060)		
Average participation	0.005	0.005		
in group 2 (other departments)	(0.038)	(0.038)		
P-value of test coeff. differ.	0.000	0.001		

[a] Notes: standard errors are corrected for clustering. The regressions include all the control variables in Table 2. Instruments are the proportion of employees in the department whose wage falls into each decile of the university-wide distribution of wages and the number of employees in the department whose tenure falls into each category. In (B), only the salary instruments are used.

respectively 0.088 and −0.099). The equality of coefficients of own- and cross-groups is rejected in both cases. Symmetrically, in the IV specification, the participation of the male employees seems to be affected by participation of other men, but not by the participation of women.

In Table 5B, C, and D we repeat the exercise by breaking the sample according to tenure (below 3 years and above 7 years), age (below or above 36), and faculty versus staff.[20] In all cases, we might expect to find positive cross-group effects, because there is no strong a priori reason to believe that peer effects are completely absent across these sub-groups. In all cases, however, cross-group coefficients are very small (sometimes negative) and insignificant, while own-group effects are always positive. In the 2SLS specifications, equality of the coefficients is rejected at the 10% level in all cases, except one where it is rejected at the 15% level.

These results, taken together, suggest both that there are no peer effects across these sub-groups within the departments and that the 2SLS results on own-group average participation are not spurious. It would be interesting to look at other groups (neighbors within department, employees with or without children, etc.). Unfortunately, we do not have this information.

In Table 5E we present a test based on the opposite idea. In the university, departments are grouped into larger units (such as libraries or the medical school), which we improperly call schools. There are 337 departments distributed among 34 schools in our sample. We regress individual participation on department participation and average participation of other departments in the same school. A positive coefficient on other departments in the same school would suggest that there is a spurious correlation, at least at the school level. The coefficients of the own department are essentially unaffected (compared to Table 4), and the coefficient of the other units within the school are small and insignificant.

The results on participation suggest that the decisions of individuals within one's peer group influence one's decision. They indicate that people may share their knowledge about the plan (and possibly other savings mechanisms). Madrian and Shea (2000b) have replicated these specifications in another context (for a large health insurance company) and find similar results to those we present here. They also present interesting additional evidence. In the firm, all the employees hired after 1998 were automatically enrolled in the TDA. Madrian and Shea (2000a) had previously shown that a very large fraction of these employees remained enrolled in the TDA. Interestingly, they show that the variations in participation across departments caused by the variation in the number of employees enrolled under automatic enrollment *does not* predict larger participation. This is what we expect if workplace effects operate through discussion and information sharing rather than through pure imitation: presumably the automatic enrollees gave very little thought to the problem, and may even not know that they are enrolled. We would therefore not expect that their enrollment would trigger any enrollment among their peers.

If this interpretation is correct, then we might also expect to see other decisions

[20]For this last sub-group decomposition only, we use data on faculty members.

to be correlated with other people's decisions within the peer group. If employees share information about the plan in the workplace, they presumably also share information about their decisions. For example, asset allocation and the choice of vendor are likely to be influenced by peer decisions. In the next section, we therefore focus on the choice of vendors.

6. Peer effects on vendor choices

We have data on the shares that each participant in the TDA allocates to each vendor. This data is useful, because these vendors offer very similar services.[21] Thus, there is less presumption that individuals may be sorted within departments according to their intrinsic preference for one vendor versus another. The reader may object that if vendors are really so similar, then the choice of vendor is of no significance, and therefore there is no particular reason to study it.[22] In particular, if there are no big differences between the vendors, the question of whether choices are influenced by colleagues does not have welfare consequences. However, the very fact that the decision is not of great economic relevance makes it less likely that people are going to feel strongly about it, and therefore that correlated effects are going to be present. In this sense, the results on vendor's choice are interesting *in combination* with the results on participation, because if we find no evidence of peer effects on vendor's choice, it will cast doubt on the results on participation: if individuals do indeed discuss whether they participate, they probably discuss as well the choice of vendor.

Moreover, the fact that there are peer effects in vendor choice despite the fact that they are similar does not necessarily imply that this is due to an (irrational) social norm of preferring one vendor versus another. A correlation between choices would be predicted by models of informational cascades, such as Banerjee (1992). Individuals have very little information on the relative advantages of these funds. This is precisely the situation where the actions of others carry the most

[21]Three of the four vendors are well known mutual funds, and the fourth is TIAA-CREF, which offers pension plans to employees in the education sector. All vendors offer a wide and similar range of mutual funds to choose from (about 40, except TIAA-CREF, which has a smaller selection, but proposes funds in each main category: one money market, two bond funds, one balanced fund, an equity fund, an equity index, and two growth funds — international and domestic — and a real estate fund. For the period ending in March 1999, the performance of comparable funds across vendors was broadly similar). There is no fee to enroll or to maintain an account and the asset allocation can be changed free of charge at any time over the phone or through a web-site. Information on all vendors is distributed by the benefits office during open enrollment. Prospectus prepared by the vendors explain the characteristics of the funds and the rules. Two out of four vendors insist on their low average expense ratio. No vendor offers the option to borrow against the invested balances.

[22]This issue is, of course, of interest at least for the vendors themselves. More generally, the industrial organization literature is often interested in consumption choices between goods that are close substitutes.

informational content, and where it is rational for them to put the most weight, in the process of making a decision about the quality of the vendor, on the fact that more of their colleagues have chosen it. It is even plausible that a social norm is less likely to dictate which vendor to choose rather than whether it is important or not to save for retirement, so that peer effects in vendor choices may reflect these kinds of rational herd behavior.

Table 6 presents the basic results on vendor choice. The dependent variable is the proportion of an individual's TDA monthly allocation which is invested with one of these vendors. The independent regressor of interest is the average of this share for every participant in the department, except the individual.[23]

For each vendor, the first column presents the OLS results, the second column presents the 2SLS results, using the proportion of people who fall into each tenure category as instruments.[24] In the third column, we present the 2SLS estimate after controlling for sample selection. We need to control for sample selection because the same factors which make people more likely to participate may make them more likely to choose one vendor rather than another (for example, if well informed people both save more and choose a given vendor), which would then introduce a correlation between the unobserved variable in our estimating equation and the equation determining selection in the sample. We control for sample selection using a procedure first suggested by Heckman and Robb (1986), then elaborated by Ahn and Powell (1993), which is to condition on the probability of selection in the sample. This requires instruments for participation in the TDA which do not influence the choice of vendor conditioning on participation. Fortunately, such instruments are available in this case, since conditional on service, salary influences participation, but not vendor choice. In practice, we first regress individual participation on individual wage, age, gender, and tenure, and the number of individuals who fall in each decile of the university wage distribution in the department (this is the reduced form corresponding to column (3) in Table 4). We then calculate the predicted value of participation and the square of the predicted value, and we include these variables in the first and second stages. Identification is not lost, since we use tenure in the department as an instrument for choice of vendor in the department.

For the three vendors, the OLS coefficients are smaller than the IV coefficients. They are very small and statistically not different from 0 in the case of vendor D and vendor V. In contrast, the IV coefficients are large and significant. They are

[23]Instead of using shares, we also ran these regressions using dummies (both on the left- and right-hand side of the regression) for whether individuals invest part of their contributions with a particular vendor. We found virtually identical results.

[24]Salary is not a valid instrument in this case because it does not predict vendor choice. The F-statistics of the first stage for the choice of vendor are large, especially for vendors R and V. Vendor V was introduced later, and there is a strong negative correlation between tenure and the share allocated to vendor V. In contrast, there is a strong positive correlation between years of service and the share allocated to vendor R.

Table 6
Peer effects on vendor choice[a]

	Share of vendor R			Share of vendor D			Share of vendor V		
	OLS (1)	2SLS (2)	2SLS (3)	OLS (4)	2SLS (5)	2SLS (6)	OLS (7)	2SLS (8)	2SLS (9)
Average share of vendor among participants in the department	0.262 (0.045)	0.490 (0.117)	0.494 (0.120)	0.088 (0.050)	0.541 (0.252)	0.543 (0.257)	−0.023 (0.045)	0.516 (0.198)	0.531 (0.195)
F-Statistic of the first stage		11.1	11.2		3.7	3.5		11.0	10.6
Number of observations	11,596	11,596	11,596	11,596	11,596	11,596	11,596	11,596	11,596
Control for sample selection	No	No	Yes	No	No	Yes	No	No	Yes

[a] Notes: sample includes all departments with number of participants above 2. Standard errors (corrected for clustering at the individual levels) are in parentheses. All regressions control in addition for gender, salary deciles, and age dummies. The excluded instrument in the equation predicting the participation is the proportion of members of the departments who fall in each category of years of service.

Table 7
Peer effects on vendor choice among sub-groups[a]

Instruments	Young (below 45) and old (above 45)		Male and female		Faculty and staff	
	Group 1 (young) 2SLS service dummies (1)	Group 2 (old) 2SLS service dummies (2)	Group 1 (female) 2SLS service dummies (3)	Group 2 (male) 2SLS service dummies (4)	Group 1 (staff) 2SLS service dummies (5)	Group 2 (faculty) 2SLS service dummies (6)
(A1) Vendor R						
Average participation	0.691	0.223	0.559	0.269	0.422	−0.039
in group 1	(0.319)	(0.429)	(0.203)	(0.237)	(0.183)	(0.196)
Average participation	0.112	0.312	0.042	0.032	0.099	0.747
in group 2	(0.196)	(0.427)	(0.249)	(0.380)	(0.105)	(0.147)
(A2) Vendor D						
Average participation	1.564	0.427	0.701	0.099	0.804	0.035
in group 1	(0.540)	(0.561)	(0.237)	(0.246)	(0.186)	(0.148)
Average participation	−0.181	0.806	−0.124	0.435	−0.080	0.877
in group 2	(0.235)	(0.256)	(0.175)	(0.335)	(0.110)	(0.234)
(A3) Vendor V						
Average participation	0.588	−0.036	0.642	−0.041	0.595	−0.204
in group 1	(0.278)	(0.255)	(0.217)	(0.225)	(0.241)	(0.272)
Average participation	−0.001	0.783	−0.238	0.344	−0.092	0.611
in group 2	(0.271)	(0.415)	(0.201)	(0.360)	(0.122)	(0.233)
Number of observations	5359	4951	6750	3573	7248	3543

[a] Notes: standard errors (corrected for clustering at the individual level) are in parentheses. All regressions control in addition for gender, salary deciles, and age dummies. The excluded instruments in the equation predicting the participation are the proportion of members of the department who fall in each category of years of service.

also very similar from vendor to vendor. They indicate that when the share invested in a given vendor by other contributors in one's department raises by 1 percentage point, one's share of investment with this vendor raises by half a percentage point. Controlling for sample selection does not affect this coefficient. This suggests that the propensity to save is not systematically correlated with vendor choice. This confirms that the factors which influence participation do not at the same time influence vendor choice. Therefore, it gives us some confidence that individuals' preferences for a particular vendor are unlikely to differ systematically from one department to another, even if propensity to participate does.

Table 7 presents the 2SLS results on the effects of participation of department members broken down by groups. We cannot present any results broken down by tenure, since tenure is our only instrument. However, we present results by age, gender, and faculty. Again, cross-group effects are absent in all cases and for all vendors, while own-group effects are positive and large in all cases, except for the men in the case of vendor R. The patterns are therefore comparable to what we have seen in the case of participation.

7. Conclusion

In this paper, we set out to study the role of peer group effects on the decision to participate in the TDA and on the choice of vendor among participants. Identifying endogenous social effects is almost an impossible task in most cases where assignment to a peer group is not random. Most individuals' decisions within a social group are correlated for reasons which have nothing to do with the fact that individuals are imitating each other. Their decisions may be influenced by common variables, observed or unobserved, such as taste, background, or common environmental factors. The application studied in this paper is a favorable case, since individuals in the university share the same plan and the same program inputs. An important source of correlation between individual's behavior is therefore eliminated.

We recognize, however, that the participation of individuals within departments may be correlated because they may share a common propensity to save or because the characteristics of some workers may have a direct effect on other's decision. After instrumenting average participation in the department with the distribution of wages in the department or the distribution of years of service, a strong effect of average participation within sub-groups in a department (along gender, service, status, or age lines) persists. In contrast, we find no effect of the participation in the other sub-group within the department. The same results are obtained for the choice of vendor among participants to the TDA. We interpret these results as very suggestive evidence that decisions taken in one's peer group influence one's decision to participate and the choice of the mutual fund vendor.

When participation increases by 1 percent in the department, one's participation increases by 0.2 percent. When the average share of the contribution invested in one vendor increases by 1 percent, one's share in this vendor increases by 0.5 percent on average.

These results, if confirmed, have several important implications. First, they contribute to the literature on the determinants of retirement savings. The work of Bernheim on financial education (Bernheim and Garrett, 1996), and Madrian and Shea (2000a) on default rules has shown that economic incentives are not the only determinants of savings decisions. This paper adds to these studies by showing that peer effects are another source of extra-economic influence on people's decisions. Individuals do not instantly learn about economic opportunities, and their environment is a strong determinant of their economic decisions. Low levels of savings by American households have been a source of preoccupation for academics and policy makers alike. Recognizing that savings decisions are influenced by peer's savings decisions could be an important element to improve our understanding of these issues. More generally, recognizing that the financial decisions of a majority of people are influenced by the actions of others should be an important element in the way we incorporate individual decisions into macroeconomic models.

Second, these results provide a possible rationale for organizing 401(k)s around the workplace. In the case of tax deferred accounts which individuals can access on their own and outside the workplace (such as IRAs), people have no obvious peer group with which to discuss their choices. The strong decline in participation in IRAs following the Tax Reform Act of 1986 has been considered as evidence that advertisement and information are one of the key elements driving participation rates (see Bernheim, 1999). When the TDA is organized by employers such as in the case of 401(k) plans, co-workers become a natural group with which to discuss it as the benefits package is common to employees, and therefore a likely conversation topic. Offering savings options organized around the workplace may therefore increase the overall level of awareness.

In this paper, we make no attempt to distinguish the effect of learning and of conformity to a social norm. Assuming that our results can be interpreted as evidence that the savings behavior of my colleagues affects my saving behavior, an important question remains unanswered. Is it because I am influenced by social norms, or because I learn from them? This distinction has strong policy implications because it determines whether or not there could be a 'multiplier effect' of financial education and economic incentives. If learning effects are important, the role of financial education may go far beyond providing information to those who are directly exposed to it. If a few individuals enroll in the plan following an information session, it might trigger non-negligible repercussion effects. This effect is potentially important when assessing the effect of education or information sessions on contribution decisions in voluntary retirement plans such as 401(k)s.

We, therefore, see this study as a first step in a broader research agenda. A simple look at existing, non-experimental data has suggested that peer effects may be present and important. this was confirmed by a few informal conversations with employees. In future work, we plan to address the shortcomings of the present study. We plan to explore two directions. First, we would like to administer an in-depth survey to a sample of employees in the university, in which we would ask about the key sources of information that have induced individuals to enroll (or not) in the plan. Second, we are planning a randomized financial education experiment, which might alter the participation rate of a random subset of employees within a subset of randomly chosen departments. We will then compare the participation rate of the non-affected individuals in these departments with the participation rate in the departments where no one was affected. By doing so, we will directly address the question of the multiplier of financial education efforts.

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