Fungibility in Workplace Benefits Choices: Evidence from Health Savings Accounts*

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Abstract

Workplace benefits now comprise roughly one-third of total employee compensation. The choice of benefits has grown increasingly complex, particularly in health insurance with the spread of Health Savings Accounts (HSAs). Using a novel survey at 15 universities linked with administrative data on retirement savings, we examine employee decision-making related to HSAs. We find that employees do not use HSAs as long-term savings and they heavily discount employer HSA deposits relative to cash. Employees offset higher HSA contributions from their employer with lower contributions themselves, and most employees do not know how or whether their HSA funds are invested. While employees with financial literacy and liquidity are more likely to treat their HSA as savings, most of this group still use HSAs to finance current health expenses. We also find strong evidence that employees prefer lower premiums to higher HSA assets, rejecting fungibility between cash and HSA assets. We discuss implications for the design of workplace benefits and financial education programs.

JEL Codes: G53, D14, I13
Keywords: Health Savings Accounts, Workplace Benefits, Financial Literacy, Liquidity, Fungibility

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1 Introduction

Workplace benefits account for an increasing share of employee compensation in the United States. Benefits grew from 27% of compensation in 2000 to 31% today (U.S. Bureau of Labor Statistics 2000, 2022), driven by generous tax preferences, legislation mandating minimum benefits, and employer competition for workers. Workers generally rank health insurance and retirement benefits as most important to them among a range of financial benefits (EBRI 2023). Standard economic models assume that employees value workplace benefits at least as much as their cost; otherwise, employers would compensate workers through higher pay instead (Goldstein and Pauly 1976, Rosen 1986, Summers 1989, Pauly 1999, Oyer 2008, Eriksson and Kristensen 2014).

However, the growing complexity of workplace benefits raises questions about whether employees do, in fact, value benefits more than their costs. Navigating benefits has become challenging as employers offer a menu of options and have shifted risk to employees through defined-contribution pension plans and consumer-directed health plans. Taking advantage of employer benefits often requires attention, financial literacy, and liquidity. Leaving benefits on the table can be costly for employees: research shows the incidence falls largely on employees, with more generous benefits coming at the expense of lower salaries (Gruber 1994, Baicker and Chandra 2006, Kolstad and Kowalski 2016, Lennon 2021). Some in the media argue that the increasing cost of workplace benefits has crowded out wage growth in recent years (Appelbaum 2018).

In this paper, we study employee decisions regarding Health Savings Accounts (HSAs), an important health benefit that is now common in the workplace. An HSA is a tax-preferred account that is paired with a High-Deductible Health Plan (HDHP).[1] HSA contributions are tax-deductible, investments grow tax-deferred, and withdrawals are tax-free if used to finance qualified health care expenses. Funds in HSAs are not "use-it-or-lose-it": all contributions may roll over from one year to the next. As we describe in Section 2, these tax advantages make HSAs attractive vehicles to finance health care costs over the life cycle. Many employers contribute to employees' HSA accounts to encourage HDHP enrollment. In 2021, 66% of large firms offered an HDHP, up from 5% in 2005 (Claxton et al. 2021). Over 30% of employees at large firms are now enrolled in these plans, which grant access to an HSA.

Using a novel survey linked to administrative records, we examine whether employees treat HSAs as fungible with other workplace benefits and how behavior varies with employee financial literacy and liquidity. This focus extends prior work that documents a high marginal propensity to consume (MPC) from HSAs while working (Leive 2022), but has been unable to directly test whether financial literacy or liquidity explains behavior. We first study HSA savings and withdrawal decisions, including the specific reasons behind employee choices. We then test whether employees value larger HSA contributions from the employer as equivalent to premium reductions. As described

[1] In 2023, IRS rules set the minimum HDHP deductible as $1,500. HDHPs provide some pre-deductible coverage. See Fronstin, Roebuck and Fendrick (2022).

in Section 2, the employee should be indifferent between (and in many cases should weakly prefer) a $1 increase in employer HSA contributions and a $1 reduction in HDHP premiums. To answer these questions, we surveyed employees at 15 colleges and universities with different levels of employer HSA contributions. The survey measures health plan choices, financial literacy (Lusardi and Mitchell 2014), liquidity constraints (Lusardi et al. 2011), and a range of behaviors and views related to insurance and saving decisions. We then link the survey data to institutional health plan data and TIAA administrative records that include detailed information on retirement accounts.

We find most employees do not use the HSA as a savings vehicle. When employers provide larger HSA contributions, employees contribute less themselves. Consistent with such offsetting behavior, survey respondents state strong preferences for using the HSA to finance current health expenses instead of future expenses. Fewer than 1 in 5 employees invest their HSA in equities or bonds, and two-thirds do not know how their HSA balance is allocated. Employees with high financial literacy and liquidity are more likely to use their HSA as a savings vehicle, but most of this group still uses the account to pay for current expenses.

We also find that employees discount employer HSA contributions relative to premiums. While employees exhibit significant price sensitivity to premiums, we find no evidence that higher employer HSA deposits increase the probability of choosing the HDHP, on average. Workers do not treat employer HSA contributions as fungible with other ways of financing health care. his behavior varies little with financial literacy or liquidity constraints. Most workers heavily discount HSA assets, even those with financial literacy and liquidity.

Our paper contributes to several related literatures in household finance and consumer decision-making. Most directly, our study adds to a growing number of studies that theoretically and empirically analyze consumer decision-making in the context of HSAs (Baicker, Dow and Wolfson 2006, Cardon and Showalter 2007, Steinorth 2011, Helmchen et al. 2015, Peter, Soika and Steinorth 2016, Spiegel and Fronstin 2021, Leive 2022). We build on this research by incorporating survey data to better understand the reasons behind employee behavior. In particular, our research documents the importance of financial literacy and liquidity constraints in saving decisions but nonetheless shows that even many people with high financial literacy and liquidity do not treat HSAs as a savings vehicle. Our results also add to studies that demonstrate the importance of frictions in choices of health insurance in the workplace (Handel and Kolstad 2015, Bhargava, Loewenstein and Sydnor 2017). Our finding that HSA dollars are discounted relative to premiums may help explain the puzzling findings that many employees choose dominated health plans, particularly when the dominant plan is often the HDHP (Liu and Sydnor 2022). Finally, we add to research from various contexts that people often do not treat money as fungible, including in children's clothing (Kooreman 2000), groceries (Milkman and Beshears 2009), gasoline (Hastings and Shapiro 2013), restaurants meals (Abeler and Marklein 2017), and SNAP benefits (Hastings and Shapiro 2018). We build on this evidence by studying fungibility in workplace benefits, which involve high monetary stakes and are choices repeatedly made each year.

The rest of the paper is structured as follows. Section 2 describes our institutional setting, health insurance context, and the data. Section 3 examines saving, investment, and withdrawal choices related to HSAs. Section 4 analyzes fungibility between HSAs and premiums and Section 5 briefly concludes.

2 Setting and Data

In this section, we first provide background on the main features of HSAs as they relate to health insurance premiums and retirement savings. We then describe the survey and administrative data.

2.1 Fungibility Between HSAs, Retirement Savings, and Health Insurance Premiums

HSAs have several features that make them tax-efficient ways to finance health care spending. Contributions are tax-deductible, accumulated investments in HSAs grow tax-deferred, and withdrawals are not taxed when used to finance qualified health expenses, including costs incurred in previous years when enrolled in an HDHP. Funds withdrawn for non-health expenses are subject to income tax, and a 20% penalty tax before age 65. HSA accumulations roll over each year and are not "use-it-or-lose-it" like FSAs. HSAs can, therefore, be used to finance current health care consumption, future health care consumption, or both. They can also be used to pay health care costs in retirement, including Medicare premiums, out-of-pocket costs, and long-term care.

Prior research has examined the optimal use of HSAs to finance health care over the life-cycle efficiently. To take advantage of the tax benefits, consumers without liquidity constraints should use their HSA as a savings vehicle, avoiding withdrawals until retirement and instead financing out-of-pocket payments with after-tax funds while working (Leive 2022). Under this neoclassical model, consumers should maximize HSA contributions up to the federal limit and reduce 401(k) contributions if needed above any employer match. The optimal strategy is more complicated for consumers with liquidity constraints. Friedberg et al. (2023) build a life-cycle model that includes HSA, 401(k), and after-tax saving accounts and includes uncertainty in health status, health spending, lifespan, and consumption shocks. Using machine learning methods to solve the dynamic problem with many state variables, they find consumers who cannot borrow should withdraw a portion of assets while working but still have positive net HSA saving until retirement (Friedberg et al. 2023). Their model also indicates that HSAs complement 401(k)s by providing liquidity to finance health shocks while working, which allows more saving in illiquid accounts.

Given the tax preferences, HSA dollars are fungible with HDHP premiums under certain conditions. Both premiums and HSA contributions enjoy the same tax benefits (including being excluded from FICA taxes if made through payroll contributions).[2] A person planning to use the

[2]In Alabama, California, and New Jersey, HSA contributions are not exempt from state income taxation. Our survey does not include employers in these states.

HSA to finance health care today should be indifferent between a lower premium of $100 versus $100 more in their HSA so long as they expected to incur at least $100 in out-of-pocket expenses this year. If $100 of health expenses is not incurred, then the premium cost is sunk but individuals still have $100 in their HSA. Most HSA providers (including all in our sample) provide account holders with a debit card, which makes the transaction costs of using the HSA to pay for care minimal. Those seeking to use the accounts to finance future health care expenses—either while working or in retirement—should prefer funds in their HSA because investment returns and withdrawals are tax-free. HSA assets are, therefore, at least as valuable as HDHP premium reductions if people are not liquidity constrained and have sufficiently high expected out-of-pocket payments. For financing health care costs in retirement, HSAs have advantages over 401(k)s, 403(b)s, or other retirement accounts because HSA assets are never taxed, unlike funds in other accounts.

HSAs make up an increasingly important component of compensation for American workers. In 2021 among workers with family coverage, employers contributed an average of $987 to an employee's HSA account (Claxton et al. 2021). Average contributions to HSA accounts were $2,320 for employees without any employer contributions and $1,970 for employees with employer contributions (Spiegel and Fronstin 2021).

2.2 Survey and Administrative Data

In 2021, we fielded a Qualtrics survey among participants actively contributing to a retirement account with TIAA at 15 universities.[3] We restricted the sample outreach to participants making positive contributions (either by the employee or the employer) to a primary or supplemental employer-sponsored retirement savings account in both 2019 and 2020. This restriction ensures that we exclude any new employees, which we sought to do so that we captured the full calendar year of health and retirement decisions.[4] The set of employers was selected to be diverse geographically and by university type and was stratified by level of employer HSA funding. Employers ranged from small liberal arts schools and mid-size private universities to flagship state public research universities and large private research universities. For confidentiality, we do not disclose the names of the employers.

Survey responses were merged with TIAA's administrative records on retirement accounts. We received responses from 2,157 individuals out of 60,804 invitations sent, for a response rate of 3.9%. A total of 1,890 people completed the survey. The survey was open for fifteen days, with two reminders sent during the open period. TIAA administrative data includes the level of contributions to retirement accounts for each participant, as well as the total balance across all accounts a participant owns. The contributions are split between primary and secondary accounts, as well as whether they came from employee contributions or employer contributions.

[3] Appendix A presents the complete survey questionnaire.

[4] This restriction means that employees were not required to make an active choice each year, and so inertia in decision-making is relevant.

Table 1 lists the universities by the number of survey respondents in each and relevant aspects of their HSA offerings. HSA contributions are flat, rather than a percentage of salary as is the case with a typical DC retirement plan. Employers contribute more to the HSA for employees on a family plan than those on an individual plan in all cases except two, where the benefit is equal.

Table 1: Institutional Sample

University	*N*	Employer HSA Contributions		
		Contribution or Match	Amount by coverage type,$	
			Employee-only	Family
A	127	None	-	-
B	32	None	-	-
C	77	None	-	-
D	99	None	-	-
E	29	None	-	-
F	421	Contribution	200–800	400–1600
G	164	Contribution	750	750
H	47	Match	400	800
I	106	Contribution	1,000	1,500
J	103	Match	1,000	2,000
K	127	Contribution	1,000	2,000
L	446	Contribution	200	400
M	185	Contribution	1,000	2,000
N	132	Contribution	1,000	1,000
O	62	Contribution	700	1,400

Note: For each University, employer HSA contributions for employee plus spouse and employee plus child(ren) coverage are the same as that for family coverage. For University F, the employer's HSA contribution depends on employee salary. Universities H and J offer a match based on employee contributions. The table lists the maximum match amount.

Table 2 contains summary statistics for the sample. The average age is 54.47 years, indicating a mid to late-career professional. The sample is majority female and over 70% are married. Just under a third of the sample are in a faculty position, and of those, 85% are either tenured or tenure-track. More than half hold a graduate or professional degree.

About 20 percent of sample respondents have a defined benefit (DB) retirement plan with their current employer as their primary plan rather than a defined-contribution (DC) plan. For their retirement contributions, the contribution is $9,762 and the bulk comes from employer dollars. Supplemental contributions are smaller and are nearly all composed of employee contributions – employers rarely provide matching or flat supplemental contributions. The average balance across TIAA retirement accounts was $380,037 with a large standard deviation, and likewise the average salary was $90,613, also with considerable variation. Appendix Table B.1 presents distribution of household income and retirement assets, including self-reported assets held outside TIAA accounts.

Table 2: Summary Statistics

	N	Mean	SD
Age	1,676	54.47	11.17
Female (%)	1,709	60.74	-
Married or with partner (%)	1,712	70.15	-
Faculty (%)	1,707	31.99	-
Education: Grad or Professional Degree (%)	1,710	59.36	-
Defined Benefit Plan (%)	1,714	20.22	-
Retirement Contributions ($)	1,729	15,331	14,950
Employer Primary ($)	1,729	7,040	6,910
Employer Supplemental ($)	1,729	192	579
Employee Primary ($)	1,729	2,722	4,226
Employee Supplemental ($)	1,729	5,377	9,201
TIAA Retirement Balance ($)	1,729	380,037	599,658
Salary ($)	1,334	90,613	69,026
High financial literacy (%)	1,707	61.3	-
Liquidity Constraints (%)	1,706	12.0	-

Note: Table presents summary statistics of the sample. The top and bottom panels contain information obtained from the survey. The middle panel includes information from TIAA administrative records.

The final two rows in the table report two key measures in the survey: financial literacy and liquidity constraints. To measure financial literacy, we pose three questions to the respondents about financial matters and note how many questions they answered correctly. We use the "Big Three" methods developed by Lusardi and Mitchell (2011) that ask about interest, inflation, and investment diversification. We classify people who answer all three questions correctly as having high financial literacy. To measure liquidity constraints, we ask how certain the respondent was that they could come up with $2,000 on short notice similar to Lusardi et al. (2011). We consider those

who were certain or probably thought they could not come up with $2,000 as liquidity-constrained.[5] We also consider individuals with an outstanding retirement plan loan with TIAA (4.8% of the sample) as liquidity-constrained. In total, we classify 12% of those answering this question as liquidity-constrained. Over 60% of respondents answered all three financial literacy questions correctly, and more than three-quarters were certain that they could come up with the $2,000. These rates indicate a sample with high financial literacy and liquidity relative to the general population. Appendix Tables B.2 and B.3 report the distribution for each of the survey responses of these two measures. We also note that financial literacy and liquidity constraints are negatively correlated in our sample, consistent with other settings (Appendix Table B.4).

3 Fungibility with Savings

In this section, we examine whether employees treat HSAs as fungible with savings and how behavior varies with financial literacy and liquidity constraints. We use the survey responses to assess whether employees treat the HSA as a savings vehicle and to further understand the reasons behind people's decisions.

3.1 HSA plans by time horizon

We first assess whether employees view their HSA as most important for short-term, medium-term, or long-term goals. We asked individuals how they plan to use their HSA balances, ranging from i) Health expenses in the current year, ii) Health expenses in the next 1 to 5 years, ii) Health expenses in the next 6 to 10 years, iv) Health expenses in retirement, and v) other expenses in retirement. Table 3 tabulates the responses for each of these uses based on a Likert scale from Strongly Agree to Strongly Disagree. Using the funds for health expenses in retirement (or reimbursements of past health expenses in retirement) maximizes the tax and growth benefits of HSAs. However, participants express the most interest in using HSAs to pay for health expenses in the current year or the next five years. Over half of respondents strongly agreed with using the HSA to pay for current health expenses compared to a third who strongly agreed with using the HSA to pay for health expenses in retirement.

We find some differences in these views by liquidity constraints and financial literacy. Respondents with high financial literacy are significantly more likely to plan to use HSA funds in retirement for health expenses (p=0.028) compared to those with lower financial literacy. Not surprisingly, employees with liquidity constraints are significantly less likely to plan to use HSA funds to finance health care expenses in retirement compared to employees who are not liquidity constrained (p=0.003).

[5] Lusardi et al. (2011) refer to this group as "financially fragile."

Table 3: How employees plan to use HSA assets (%)

	Strongly Agree	Agree	Neither Agree nor disagree	Disagree	Strongly Disagree
Health expenses in current year	52	24	8	5	9
Health expenses in next 1 to 5 years	37	36	13	6	8
Health expenses in next 6 to 10 years	31	30	20	9	10
Health expenses in retirement	33	26	21	10	11
Other expenses in retirement	8	10	33	21	27

Note: Table reports percentages of respondents who report agreement or disagreement with using the HSA for different purposes that are reported in each row. Column totals sum to 100 across rows.

3.2 HSA decisions: contributions, balances, withdrawals, and asset allocation

We empirically study a range of behaviors related to using the HSA as an additional form of savings, including contribution amounts, balances, withdrawals, HSA investments, and other decisions. In the next subsection, we run linear probability models to describe the conditional correlation between these decisions and employer HSA contributions, financial literacy, and liquidity constraints. Before presenting the regression results, we provide averages and raw correlations to provide a sense of the context and how our setting compares to others.

HSA contributions: About half of employees in the HDHP contribute more than $3,000 to their HSA account. Approximately 30.9% contribute the maximum amount, which is higher than in other settings (Fronstin 2021). We asked respondents the reasons why they chose that contribution amount. The top three reasons reported were (i) based on expected health care spending, (ii) it was the most they could contribute, and (iii) to maximize the HSA's tax benefits. Few individuals reported making contributions to match their deductible. There are stark differences by financial literacy and liquidity constraints. 44% of employees with high financial literacy said they chose that amount to maximize the HSA's tax benefits compared to 26% of individuals with lower financial literacy (Appendix Figure B.3). Over half of employees with liquidity constraints said their contribution amount was the most they could afford, compared to 19% of employees who were not liquidity constrained (Appendix Figure B.4).

HSA balances: On average, 19.2% of employees in the HDHP have balances over $5,000, 24.8% have balances below $500, and 17.1% did not know their balance. Approximately 38% of individuals with high financial literacy have balances over $5,000 compared to only 13% with lower financial literacy. Perhaps more striking is that 58% of employees with lower financial literacy indicated less than a $500 balance or they did not know their balance, compared to 33% with high financial literacy. Patterns are similar when split by liquidity constraints: employees facing liquidity constraints are 91% more likely to have indicated less than a $500 balance than those who are not (Appendix Figure B.6). Overall, the modest size of (self-reported) HSA balances among survey respondents is consistent with descriptive studies using administrative data from a large number of

employers (Fronstin 2021).

HSA withdrawals: Most employees use the HSA to finance short-term spending. 46.9% withdrew some portion of their HSAs in the last year, and 27.9% withdrew either most or all of their balance. Not surprisingly, employees with liquidity constraints are more likely to withdraw a larger share of their HSA balance. When employees incur health expenses, they pay using their HSA. Few employees pay health expenses with other funds, which is a strategy that maximizes the tax benefits by allowing HSA expenses to grow. This is true even for the large majority of employees with high financial literacy who are not liquidity-constrained (Appendix Figure B.7 and Figure B.8).

HSA asset allocation: We asked employees if their HSA accumulations were held in cash or money market accounts, primarily equities, primarily bonds, roughly split between equities and bonds, or whether they did not know. Less than one in five respondents reported that their balances were invested in non-cash, consistent with past work showing that few participants invest their accumulations (Fronstin 2021). Strikingly, 65% of individuals reported that they did not know—including not knowing whether their accumulations were in cash. We again find significant differences in asset allocation by financial literacy and liquidity constraints. Employees with high financial literacy were more likely to know how and if their balances are invested than employees with lower financial literacy (Appendix Figure B.10). Employees with liquidity constraints may not want to invest accumulations in order to use those funds to finance current health care consumption or to reimburse earlier medical costs to manage current liquidity needs. However, these employees are more likely to state they do not know how or if their accumulations are invested compared to employees without liquidity constraints (Appendix Figure B.9).

3.3 Linear Probability Models of HSA Decisions

To focus on magnitudes and assess statistical significance of these outcomes, we estimate the following linear probability models:

$$y_{ics} = \eta_0 + \eta_1 f_i + \eta_2 l_i + \eta_3 h_{cs} + \lambda_c + u_{ics} \tag{1}$$

where y_{ics} is a binary measure of a particular HSA decision for employee i with coverage type c at university s, f_i is an indicator for high financial literacy, and l_i is an indicator for being liquidity constrained. We also control for employer HSA contributions in \$1,000s (h_{cs}) and an indicator for coverage type. We exclude demographic controls because they are correlated with financial literacy and liquidity constraints, and our interest is in measuring the overall correlations of these variables with HSA decisions. It is important to note our focus is on quantifying how behavior differs by employees based on financial literacy and liquidity constraints. We are not measuring the causal effect of financial literacy or liquidity since they do not vary exogenously in our setting, and we do not view controlling for demographics as sufficient for this purpose.

We only observe HSA outcomes for employees who choose the HDHP. We therefore also

estimate selection models in Appendix Table B.7, using employer HSA contributions as an excluded variable from the outcome equation that is only included in the selection equation. The results for financial literacy and liquidity constraints are qualitatively similar, with most larger in magnitude and retaining statistical significance. In all but one outcome (choosing the HSA contribution to maximize the tax benefits), we fail to reject the null of zero correlation between the errors in both the selection and outcome equations. Our main results therefore proceed by showing results from estimating Equation 1 by OLS.

Table 4 presents the regression estimates. Column 1 shows the results for contributing more than $3,000. Employees with high financial literacy are 8 percentage points more likely to do so, and employees with liquidity constraints are 19.1 percentage points less likely to do so. Interestingly, employer HSA contributions are negatively correlated with employee contributions. Employees may tacitly view the employer's HSA deposit as "sufficient" and that further contributions are unnecessary if their goal is to finance short-term health expenses, as shown earlier. In choosing their contributions, employees with high financial literacy are 13.7 percentage points more likely to do so to maximize the tax benefits while those with liquidity constraints are 15.3 percentage points less likely to do so (column 2). Employer HSA contributions are negatively correlated with the employee's decision to choose to maximize the tax benefits from their own contributions.

There are again strong differences by financial literacy and liquidity when considering HSA balances (column 3) and withdrawals (column 4). The probability of having an HSA balance over $2,000 is 28.4 percentage points higher among those with high financial literacy and 15.5 percentage points lower among those who are liquidity-constrained. Consistent with these differences, the probability of withdrawing all or most of HSA assets is 16.1 percentage points lower for employees with high financial literacy and 22.2 percentage points higher for those with liquidity constraints. These magnitudes are very large relative to the mean of the dependent variable. Finally, even while many employees do not know how their HSA is invested, employees with high financial literacy are 23.4 percentage points more likely to know, and those with liquidity constraints are 14.6 percentage points less likely to know (column 5). These magnitudes are again large. In addition to this main specification, we find similar results for financial literacy and liquidity constraints when including employer fixed effects instead of employer HSA contributions, as shown in Appendix Tables B.8–B.12.

To further examine financial literacy and liquidity, Figure 1 shows results from linear probability models that include interactions of these two variables. For ease of interpretation, we plot the predicted proportion of each group. The red whiskers denote the 95% confidence intervals that the group means are different relative to employees with high financial literacy who are not liquidity-constrained. The largest differences are between this group and employees with low financial literacy who are liquidity-constrained. The differences are always statistically significant between these groups and the magnitudes are large. For example, around 15% of liquidity-constrained employees with low financial literacy chose the HSA for its tax benefits

compared to nearly 50% of employees with high financial literacy who are not constrained (panel b). Similarly, about 25% of liquidity-constrained employees with low financial literacy have balances over $2,000 versus 65% of employees with high financial literacy who are not constrained (panel c). The rate of withdrawing all or most of the HSA is three times as high for liquidity-constrained employees with low financial literacy versus employees with high financial literacy who are not constrained (panel d), and the rate of not knowing how HSAs are invested is twice as high (panel e). Collectively, these results point to stark differences in how HSAs are used by employees with different levels of financial literacy and liquidity.

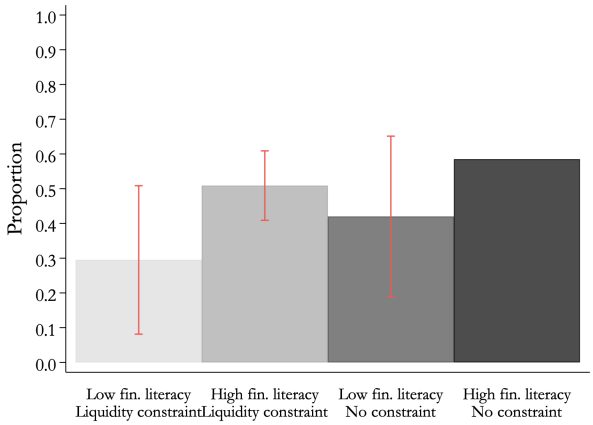
Table 4: Linear Probability Models of HSA Behavior

	Contributed $3,000 or more	Chose contribution to maximize tax benefits	HSA balance over $2,000	Withdrew all or most of HSA	Unsure how HSA balance is invested
	(1)	(2)	(3)	(4)	(5)
High financial literacy	0.101**	0.150***	0.280***	-0.153***	-0.238***
	(0.049)	(0.039)	(0.047)	(0.042)	(0.046)
Liquidity constrained	-0.180**	-0.146**	-0.169**	0.235***	0.160*
	(0.082)	(0.063)	(0.078)	(0.069)	(0.076)
Employer HSA contributions ($1,000s)	-0.076**	-0.071**	-0.042	0.036	0.003
	(0.034)	(0.028)	(0.033)	(0.029)	(0.032)
Dep. var. mean	0.320	0.284	0.507	0.267	0.604
N	431	585	505	509	510

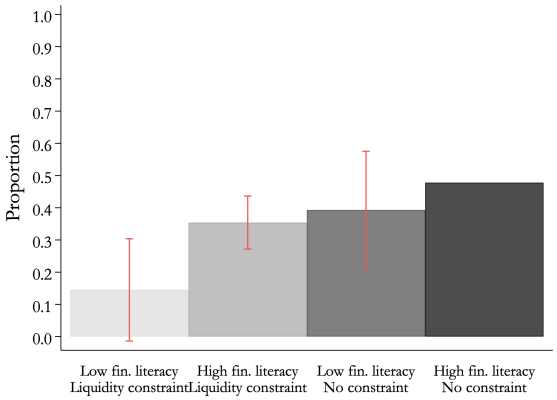
Note: Table shows results of linear probability models of different types of HSA behavior against employer HSA contributions, financial literacy, and financial fragility. High financial literacy is defined as answering all three financial literacy questions correctly. Liquidity constraints are defined as either (1) having an outstanding 403(b) loan, or (2) reporting they certainly could not or probably could not come up with $2,000 in 30 days to finance an expected expense. Regressions also include an indicator for employee-only coverage and a constant. Standard errors in parentheses. *** $p<0.01$, ** $p < 0.05$, * $p<0.1$.

Figure 1: Relationship between HSA Decisions, Financial Literacy, and Liquidity

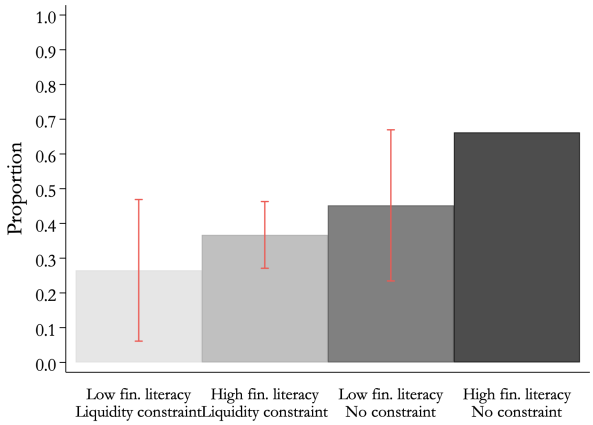
(a) Contributions over $3,000



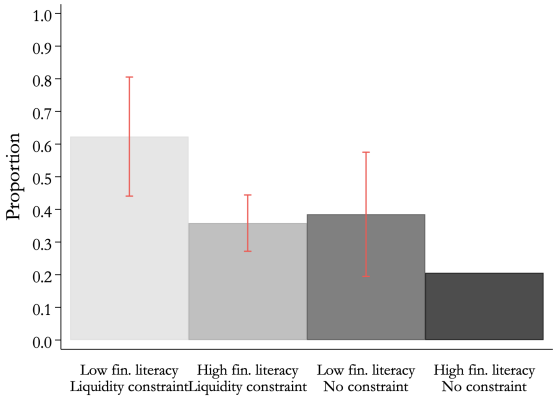
(b) Chose HSA for tax benefits



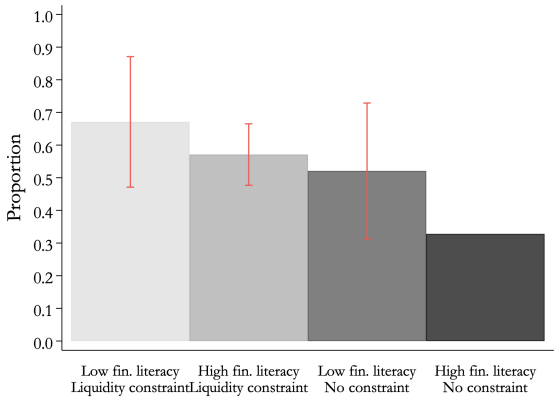
(c) HSA balances over $2,000



(d) Withdrew all or most of HSA



(e) Unsure how HSA balance is invested



Notes: Figures plot results of linear probability models of HSA decisions against types of employees based on financial literacy and liquidity. Each panel corresponds to a separation regression. The predicted proportions of employees who report the HSA decision are shown on the y-axis using the regression model. The omitted type from the model are employees with high financial literacy who are not liquidity constrained. The red whiskers on the other three bars plot the 95% confidence interval that the means between that group and the other group is equal. Regressions also include employer HSA contributions and indicators for family coverage.

4 Evidence on Fungibility with Health Insurance Premiums

In the previous section, we found employees do not treat HSAs as fungible with savings. In this section, we test whether employees treat HSA contributions as fungible with insurance premiums. The neoclassical view is that these two sources of financing health care are fungible: a dollar reduction in premiums should be equivalent to a dollar increase in HSA funds. However, employees may value them differently due to liquidity constraints, gaps in knowledge, or other behavioral frictions. For example, if employees are especially concerned about large out-of-pocket medical expenses, a plan with a high deductible (and HSA) may be less appealing. Other employees may not fully realize the tax benefits of HSA contributions or what consumption can be financed by HSA accumulations. This section first uses the survey data to test for fungibility, explores heterogeneity in behavior, and describes reasons for choosing or avoiding the HDHP. We then supplement this analysis with administrative data that include health insurance claims from one of the survey's universities.

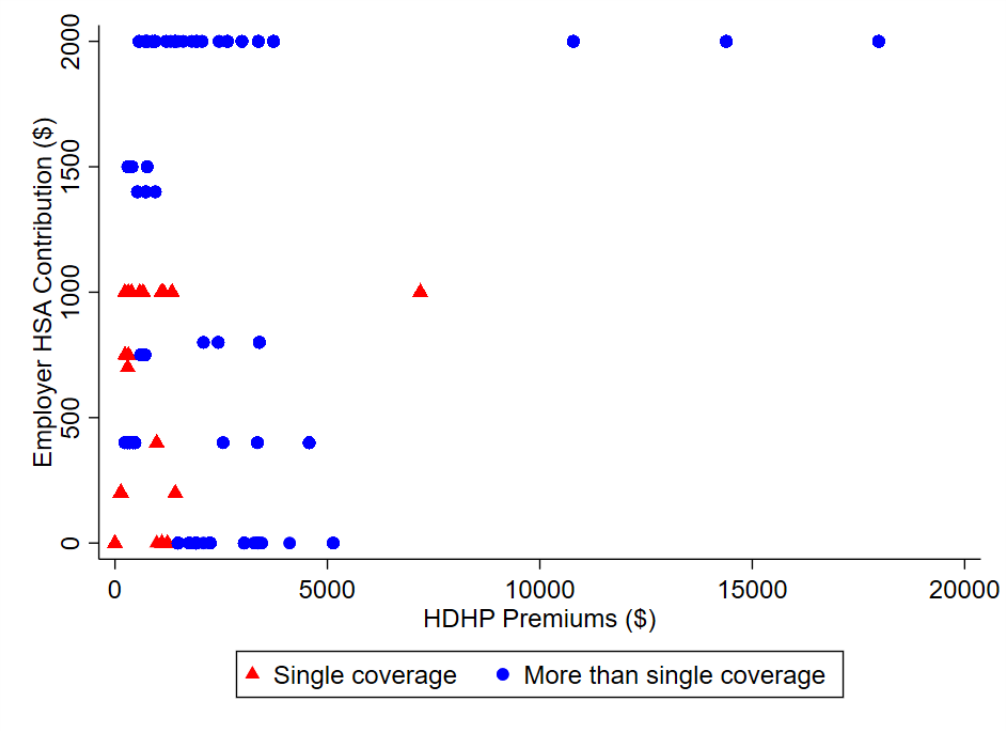
4.1 Empirical strategy

To fix ideas, we first discuss the ideal way to test fungibility in this context and then describe the variation and approach we use in practice. Consider choosing between two health plans—an HDHP with HSA and a traditional plan. Suppose the plans are only differentiated along financial ("vertical") characteristics. Provider networks and any other "horizontal" characteristics are the same. The ideal experiment to test fungibility would be to randomly assign each employee different combinations of premiums (p) and employer HSA contributions (h) to the HDHP while holding the prices and features of the other health plan fixed. If employees value premiums and employer HSA contributions equally, then the share of people choosing the HDHP under the bundle $(p, h+1)$ should equal the share choosing the HDHP under the bundle $(p-1, h)$. If more people choose the HDHP under $(p-1, h)$ than under $(p, h+1)$, then HSA deposits are valued less than premiums. And if fewer people choose the HDHP under $(p-1, h)$ than under $(p, h+1)$, premiums are valued less than HSA deposits.

We lack randomized variation in premiums and HSA deposits. Instead, we exploit differences across employer offerings in our survey sample. Figure 2 visualizes this variation, with the vertical axis denoting the level of annual employer HSA contributions and the horizontal axis denoting the employee portion of the premium for the high-deductible health plan. Red triangles indicate employee-only coverage, and blue circles show plans with spousal coverage, family plans, and other plans that cover more than one person. There

is considerable variation in both premiums and employer HSA contributions; some plans with the same premium differ in their level of employer HSA deposits, and some plans with the same HSA deposit differ in their level of premiums.

Figure 2: Variation in HSA Employer Contribution Amounts and HDHP Premiums



Notes: Figure plots the combination of annual HSA employer contributions and annual HDHP premiums in the institutional sample. Each dot represents a coverage type, with triangles denoting employee-only coverage and circles denoting employee + child(ren), employee + spouse, or family coverage.

To operationalize this empirical approach, we estimate a linear probability model of choosing the HDHP using the following specification:

$$HDHP_{ics} = \alpha + \gamma_0 p_{cs} + \gamma_1 h_{cs} + \gamma_2 D_{cs} + \gamma_3 L_{cs} + x_{ics}\phi + \lambda_c + e_{ics} \tag{2}$$

where $HDHP_{ics}$ is an indicator for employee i with coverage type c at employer s choosing the HDHP. The variable p_{cs} denotes premiums in the HDHP for coverage type c at employer s and h_{cs} denotes employer HSA contributions.

Under the ideal setting we described above, other characteristics of the plan are held fixed and premiums and HSA deposits are randomly assigned. Since we lack random variation, we control for the deductible D_{cs} and the out-of-pocket max L_{cs} of the HDHP, employee characteristics x_{ics}, and fixed effects for coverage types (λ_c). Appendix Table B.5 presents the F-statistic from balance tests of covariates against employee HDHP premiums

and employer HSA contributions to assess whether the key independent variables are related to employee or employer characteristics. While education levels and faculty types do not differ systematically across schools with different HSA contributions and premiums, other individual and plan characteristics do. We control for these variables in our regressions, but our estimates will be biased if other omitted characteristics are correlated with HSA contributions. Concerns about such omitted variable bias motivate using the method of Oster (2019) to investigate the extent of selection on unobservables, as well as a second approach that we describe in Section 4.4.

The key coefficients in Equation 2 are γ_0 and γ_1. We expect higher HSA contributions to be positively associated with choosing the HDHP ($\gamma_1 > 0$) and higher HDHP premiums to be negatively associated with choosing it ($\gamma_0 < 0$). Our test of fungibility is $\gamma_0 = -\gamma_1$.

4.2 Regression Results

Table 5 presents our main regression results from estimating Equation 2. Column 1 includes all employees in the survey. The key independent variables are the employer HSA contribution and the HDHP premium (both of which are measured in $1,000s). As expected, premiums enter negatively and are highly statistically significant. Raising annual premiums by $1,000 reduces the probability of choosing the HDHP by 2.2 percentage points, relative to a mean of 35%. Surprisingly, the employer's HSA contribution also enters negatively: employees receiving a higher HSA deposit for choosing the HDHP are *less* likely to choose it, conditional on premiums, deductibles, out-of-pocket limits, and other characteristics. In terms of magnitudes, the estimate on HSA contributions is quite large, at over five times the size of the estimate for premiums.

As shown in the last row of the table, we strongly reject the null hypothesis that $\gamma_0 = -\gamma_1$. However, the large and statistically significant negative coefficient on HSA contributions makes us reluctant to necessarily interpret this result as evidence against fungibility. One concern might be that omitted factors vary across employers in ways correlated with the size of employer HSA deposits and takeup of HDHPs. For example, if employers with generous HSA deposits pursue less promotion than employers with less generous HSA deposits, the effect of HSA deposits may be biased downwards. Or if employers with higher HSA contributions make lower employer contributions to premiums, then the estimate on HSA contributions would again be biased downwards.

We use the method of Oster (2019) to formally assess the potential bias from unobservables on γ_1. We calculate Oster's delta, which measures how much selection on unobservables relative to observables would be needed to explain our estimate for γ_1. Since our interest is not in whether $\gamma_1 = 0$ but whether $\gamma_0 = -\gamma_1$, we calculate Oster's delta

against a hypothesis that $\gamma_1 = 0.014$, which is the lower bound of the 95% confidence interval on γ_0. We set the maximum R^2 to be 50% higher than in our regression controlling for observables. With these parameters, selection on unobservables must be 1.04 times greater than selection on observables for us to fail to reject $\gamma_0 = -\gamma_1$. We view this degree of selection as unlikely, given that the observables we control for represent the most important financial characteristics of plans that are highly visible and salient to consumers.

Table 5: Linear Probability Models of HDHP Choices

	(1)	(2)	(3)	(4)	(5)
γ_0, Employee premiums	-0.022***	-0.023***	-0.022***	-0.022***	-0.022***
($1,000s)	(0.004)	(0.005)	(0.006)	(0.004)	(0.006)
γ_1, Employer HSA contributions	-0.110***	-0.105***	-0.128***	-0.118***	-0.118***
($1,000s)	(0.024)	(0.031)	(0.040)	(0.027)	(0.032)
Coverage Controls	Yes	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes	Yes
Deductible and out-of-pocket max	Yes	Yes	Yes	Yes	Yes
Sample includes:					
High financial literacy	Yes	Yes	No	Yes	Yes
Low financial literacy	Yes	No	Yes	Yes	No
Not liquidity constrained	Yes	Yes	Yes	Yes	Yes
Liquidity constrained	Yes	Yes	Yes	No	No
Dependent variable mean	0.356	0.388	0.322	0.365	0.379
N	1,207	719	482	1,052	670
p-value of test $\gamma_0 = -\gamma_1$:	<0.001	<0.001	<0.001	<0.001	<0.001

Note: Linear probability models of choosing the HDHP with robust standard errors in parentheses. Demographic controls include gender and indicators for 10-year age bins, income bins, and retirement asset bins. All regressions include indicators for coverage type, the HDHP deductible and out-of-pocket max, and a constant. Column 1 includes all survey employees and Columns 2-5 restrict to different sub-samples based on financial literacy and liquidity constraints. High financial literacy is defined as answering all three questions correctly. Liquidity constrained is defined as either taking out a 403(b) loan or reporting they certainly could not or probably could not come up with $2,000 for an unexpected expense within 30 days. *** $p<0.01$, ** $p < 0.05$, * $p<0.1$.

To investigate heterogeneity by financial literacy and liquidity, we split the sample according to financial literacy and liquidity constraints. As a reminder, we classify employees answering all three questions correctly as possessing high financial literacy and those answering at least one incorrectly as having low financial literacy. We classify employees as liquidity-constrained if they report certainly or probably not being able to come up with $2,000 in 30 days to finance an unexpected expense or if they have an outstanding loan from their 403(b). Columns 2 through 5 of Table 5 present the results of estimating equation Equation 2 for those with high financial literacy (column 2), low financial literacy (column 3), not being liquidity constrained (column 4), and finally those with high financial literacy who are not liquidity constrained (column 5). In each case, the results are remarkably similar to those of the full sample in column 1. We continue to observe the same patterns, even for those who are not liquidity-constrained and have high financial literacy. As before, these results should be interpreted descriptively rather than causally.

4.3 Reasons for HDHP choices

In our sample, 35.6% selected the HDHP, 54.9% did not, and 9.5% did not know if they had. Of those not choosing the HDHP, only 6.2% would be likely or very likely to choose an HDHP in the future if offered, while 75.6% would not.

To analyze the reasons behind people's plan choices, Table 6 shows how participants responded when asked why they chose (or did not choose) the HDHP available to them. The vast majority of those who did not choose the HDHP indicated either that the deductible was too high or that they expected high medical expenses. About 16% indicated that they thought managing the HSA would be too confusing.

Over a third of respondents said that there was no HDHP option, even though every person in the sample had an HDHP as part of their menu of health insurance options. This large share is evidence of considerable information and logistical barriers surrounding HDHPs and HSAs. For example, employees may not know which of their insurance options are HDHPs and which are not. If they are not familiar with the details of plan design, they may not understand certain terminology or plan features (Loewenstein et al. 2013). Knowledge gaps seem especially likely in the case of HDHPs with HSAs, which are a complex and potentially unfamiliar product. Employees may also continue to make the same non-HDHP insurance selection each year due to inertia without knowing that an HDHP option exists.

Among those choosing the HDHP, the most common reason was that premiums were lower (59.8%), followed by the option to have an HSA (53.7%). Just over 4% (incorrectly) reported it was the only option available. Workers may face several potential knowledge gaps that affect their HDHP choices, from not knowing about the three tax advantages of

the HSA to not knowing that it is possible to treat HSA balances and contributions as a long-term investment vehicle. Any of these gaps may dissuade a worker from choosing the HDHP when it is available to them.

Table 6: Reasons for Health Insurance Choices

Why did you choose the HDHP?	(%)	Why did you not choose the HDHP?	(%)
Premiums were lower	59.8	Expected to have high medical spending	69.5
For the option to have an HSA	53.7	HDHP was not an option	35.2
Expected to have little medical spending	31.5	Deductible was too high	19.5
Expected to have high medical spending	10.2	It was not recommended	16.7
It was recommended	9.2	Managing HSA confusing or hassle	16.4
HDHP was only option	4.3	Expected to have little medical spending	13.0
		Thought HSA couldn't roll over	0.9
N= 587		N= 879	

Note: Table reports the reasons people report for either choosing the HDHP or not choosing it. Percentages sum to over 100% because respondents could select more than one reason.

4.4 Case Study Results using Claims Data

In this sub-section, we use within-employer variation and administrative data from a large university (one of the 15 included in the survey) to address possible concerns around omitted variable bias from Table 5. A second rationale for using this data is that observing both plan choice and spending data for all enrolled university employees allows us to implement a discrete choice analysis that lends itself to a structural interpretation.

The case study university began offering an HDHP alongside its two traditional health plans in 2014. We use data from 2012 to 2017 that combines plan choices, job characteristics, and annualized spending data aggregated from insurance claims. The plans are vertically differentiated, but all other plan features (e.g. provider networks) are identical. If the employee chose the HDHP, the university would make unconditional contributions to the employee's HSA, equal to $1,000 for employee-only coverage, $1,500 for employee plus spouse or child(ren) coverage, and $2,000 for family coverage. These contribution amounts stayed fixed while premiums increased over this time frame.[6] We use the variation within this employer in premiums (over time and across coverage types) and in HSA contributions (across coverage types) to estimate whether premiums and employer HSA contributions are valued equally. A limitation of this data is that we do not observe variation in employer HSA contributions within coverage types over our sample period.

[6]In 2021, the year of our survey, the university contribution amounts were $1,000 for employee-only coverage and $1,500 for family coverage.

Using the spending data, we construct measures of the expected out-of-pocket costs for each employee if they enrolled in each of the three plans. Annual health spending is split into dollars paid by insurance and dollars paid out-of-pocket by employees, and is separately reported for in-network and out-of-network care. We use this information for each employee and any dependents (and also observe if an employee or dependent records zero claims) to construct a distribution of costs at the family level. We use the empirical distribution of costs by 5-year age, gender, and terciles of lagged health spending to construct expected costs. Appendix C describes the details of this procedure. Using this distribution, we calculate the variance of out-of-pocket costs at the family level.

Our empirical approach is similar to the estimating equation of Abaluck and Gruber (2011), which specifies utility as a linear function of premiums, expected out-of-pocket payments, and plan characteristics. We further add employer HSA deposits and individual-level characteristics as in Geruso, Layton and Leive (2023) to estimate the following conditional logit model:

$$U_{ijt} = \pi_{jt}\beta_0 + \eta_{jt}\beta_1 + \mu_{ijt}\beta_2 + \sigma^2_{ijt}\beta_3 + \xi_{jt}\beta_4 + O_{jt}\beta_5 + x_{it}\delta + \phi \cdot 1(j = j^*_{t-1}) + \epsilon_{ijt} \qquad (3)$$

where π_j denotes premiums in plan j, η_j denotes HSA contributions (which are zero for the non-HDHP plans), μ_{ij} denotes expected out-of-pocket payments for employee i in plan j and σ^2_{ij} denotes the variance of those payments. We also include the deductible ξ_j and out-of-pocket limit O_j as additional plan characteristics. We include employee characteristics x_i (quartiles of salary, 5-year age bins, tenure with the employer, and indicators for gender, academic division, and faculty). To capture the role of inertia in plan choices, $1(j = j^*_{t-1})$ is an indicator for employees choosing plan j in the previous year. ϵ_{ij} is an i.i.d. error term with a type I extreme value distribution. We cluster standard errors at the individual level since we observe multiple years of data for most employees.

If premiums and employer HSA deposits are treated equally by the employee, then $\beta_0 = -\beta_1$. A premium reduction of one dollar equals an HSA increase of one dollar. We can also test whether premiums are treated equivalently to expected out-of-pocket payments by testing $\beta_0 = \beta_2$ or whether premiums are treated equivalently to the deductible by testing $\beta_0 = \beta_4$.

Table 7 presents the results from estimating Equation 3. As expected, premiums and expected out-of-pocket payments enter negatively. Now, the estimate on HSA contributions is small, positive, and not statistically different from zero. We strongly reject the null that HSA contributions and premiums are valued equally by employees, as reported in the last row of the table. Appendix Table B.6 shows the same pattern is also observed regardless

of employee age, faculty/staff status, or income. These results provide evidence against the hypothesis that employees view HSAs as fungible with health insurance premiums. Employees prefer a reduction in health insurance premiums to an equally-sized increase in HSA contributions.

Table 7: Conditional Logit Results, Case Study Sample

	(1)	(2)
β_0, Employee Premium (hundreds)	-0.398***	-0.311***
	(0.030)	(0.031)
β_1, Employer HSA contribution (hundreds)	0.003	0.018
	(0.018)	(0.018)
β_2, Expected out-of-pocket costs (hundreds)	-0.032***	-0.013*
	(0.007)	(0.006)
β_3, Variance of out-of-pocket costs ($\times 10^6$)	0.045*	-0.008
	(0.023)	(0.023)
β_4, Deductible (hundreds)		-0.300***
		(0.014)
β_5, Out-of-pocket limit (hundreds)		-0.026***
		(0.006)
NT	210,860	210,860
p-value of test $\beta_0 = -\beta_1$:	<0.001	<0.001

Note: Table shows results of conditional logit models estimated in Equation 3. Coefficients estimates reported are the parameters of the utility function, not marginal effects. Regressions also indicators for salary bins ($20,000), age (5-years), gender, academic vs. medical division, faculty, above-median tenure, and lags of previous plan choices. Standard errors clustered by employee reported in parentheses. *** $p<0.01$, ** $p < 0.05$, * $p<0.1$.

The estimates for expected out-of-pocket payments are consistent with research from other settings. We find employees are much more sensitive to premiums than to expected out-of-pocket payments, similar to research on choices of Medicare drug plans (Abaluck and Gruber 2011). While expected out-of-pocket costs still enter negatively, the coefficient is statistically distinguishable from both zero and the coefficient on premiums. Employees are sensitive to the deductible, even conditional on expected out-of-pocket payments. The coefficient estimate on the deductible is very similar to that for premiums (-0.300 vs. -0.311), and we fail to reject they are equal.

5 Discussion

This paper uses a survey across 15 universities linked with administrative data on TIAA retirement accounts to study how employees view Health Savings Accounts relative to other workplace benefits, and how behavior differs by financial literacy and liquidity.

We find employees do not use HSAs as a savings vehicle. Respondents state stronger preferences for using the HSA to finance current health care expenses compared to expenses in the future. Consistent with this preference, we find a negative correlation between employer HSA contributions and employee contributions. Some employers may provide larger HSA contributions to encourage employees to build up savings, but we find evidence that employees instead offset these funds through lower contributions of their own. Moreover, few people invest their HSA assets in equities or bonds, and nearly two-thirds do not know how their assets are allocated. While many HSA providers have an accumulation floor before investing is possible (often a few thousand dollars), many survey respondents forego the potential for upside growth and greater post-tax wealth. We observe significant differences in HSA savings behavior by financial literacy and liquidity, but even most people with high financial literacy who are not liquidity constrained do not use their HSA primarily as a savings vehicle. We also find that employees value employer HSA deposits less than an equal-sized reduction in health insurance premiums. Our results reject the standard model of consumer behavior that assumes people should treat premiums and HSAs as fungible when financing health care consumption.

It is important to highlight several limitations of the study. First, we rely on survey responses for information about money in employee Health Savings Accounts. While some information cannot be obtained from administrative data, such as why an individual chose their HSA contribution amount, self-reported levels of contributions and withdrawals are less accurate than administrative records. Second, our sample is limited to employees in higher education who have financial literacy and incomes above the US average. However, we structured our survey to obtain a sample across large and small employers that are also geographically dispersed.

The relatively high levels of financial literacy, assets, and liquidity among our sample respondents also provides a helpful benchmark for interpreting the results. One might believe that employees in this context are better equipped to make informed decisions about benefits and to handle the possibility of high out-of-pocket exposure in return for greater long-run savings. Our findings provide a cautionary tale regarding how employees evaluate workplace benefits with complicated features. Many employers (including those in this setting) already provide benefit education programming and ample resources for employees

to acquire information and make decisions. Our results, however, suggest that existing efforts to aid HSA decision-making face challenges and motivate the consideration of other "light-touch" interventions. For example, research from lab and field settings have studied targeted advice and assistance to help employees navigate non-HSA decisions, including simplifying the financial consequences of insurance choices (Samek and Sydnor 2020) or defaults that could be tailored to individual circumstances (Gruber et al. 2020). In the context of HSAs, interventions might involve default contribution rates and investment allocations based on employee demographics or other benefit choices. Future work might explore whether such interventions would be valuable to employees, employers, and plan sponsors. Our findings suggest there is substantial scope to improve decision-making and increase economic security of employees, even among those with high financial literacy and liquidity.

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A Appendix: TIAA Institute Survey [For Online Publication]

In June 2021, we fielded a Qualtrics survey among participants holding retirement accounts with Teachers Insurance and Annuity Association of America (TIAA) at 15 universities. The set of employers was selected to be diverse geographically and by university type. We also stratified the survey by level of employer HSA funding. Survey responses were merged with TIAA's administrative records on retirement accounts. We restricted the survey to active participants, defined as having positive contributions (either by the employee or the employer) to a primary or supplemental employer-sponsored retirement savings account in both 2019 and 2020. We received responses from 2,157 individuals out of a total of 60,804 invitations sent, for a response rate of 3.9%. A total of 1,890 people completed the survey.

Details of survey instrument and questions: The following text was included in an email with a link to the survey, and on the landing page for the survey. The text listed the contact information for Brent Davis. In reproducing the survey below, we exclude the questions asking about demographics and employment categories (staff vs. faculty, part-time vs. full-time, etc.) for brevity.

HEALTH SAVINGS ACCOUNT SURVEY

The cost and financing of health care is an area of increasing concern for many workers. We are interested in learning more about how individuals use Health Savings Accounts. As part of our research, we are conducting a survey that examines workers' health plans and Health Savings Accounts.

We request your participation in the survey. The survey is completely voluntary, as is answering each question. Your answers, identity as a participant, and all personal identifying information will be kept confidential and will not be shared with anyone outside of this research project.

Please click on the link below to complete our brief online survey. The survey tool is designed to work on either a computer or a mobile device. The estimated time to take this survey is 10 - 12 minutes and will be available to you for up to 14 days from today.

If you would like to contact the researchers, you may contact them based on the information below. You may call collect if you identify yourself as a research participant.

Q1: What is your approximate annual household income?

- ◦ Less than $25,000
- ◦ $25,000 to $49,999
- ◦ $50,000 to $79,999
- ◦ $75,000 to $99,999
- ◦ $100,000 to $149,999

- $150,000 to $249,999
- $250,000 or higher

Q2: What is the approximate amount of your total household retirement assets? Include approximate assets in all of your household's Individual Retirement Accounts (IRAs), 401(k)s, and 403(b)s.

- Less than $50,000
- $50,000 to $99,999
- $100,000 to $149,999
- $150,000 to $249,999
- $250,000 to $449,999
- $500,000 to $999,999
- $1 million or greater
- Don't know
- Prefer not to answer

Q3: Did you participate in a Defined Benefit plan in 2020 with your current employer? This is also known as a traditional pension that pays retirees a monthly benefit amount depending on their salary, age, and years of service.

- Yes
- No
- Don't know

Q4: Were you covered by employer-based health insurance in 2020?

Employer-based health insurance is one offered by your (or your spouse's) employer, and premiums are usually paid by both the employee and the employer.

- Yes, through my employer
- Yes, through my spouse's/partner's employer
- No
- Don't know

Q5 [If Q4 = Yes]: Who is covered by the employer-based health insurance plan?

- Only myself
- Myself and my spouse/partner only
- Myself and my children only
- My family (i.e. myself, my spouse/partner, and children)
- Don't know

Q6 [If Q4 = Yes]: Was that insurance a high-deductible health plan (HDHP)?

A high-deductible health plan (HDHP) has lower monthly premiums but a high-deductible that employees must meet before insurance begins to pay for medical claims. A HDHP usually provides access to a Health Savings Account (HSA).

- Yes
- No
- Don't know

Q7 [If Q6 = No]: Why did you (your spouse/partner) not choose the HDHP insurance plan? (Choose all that apply)

- A high-deductible health plan was not an option
- Deductible was too high
- Expected to have high medical spending in 2020
- Expected to have little medical spending in 2020
- Thought managing the HSA would be a hassle or confusing
- Thought the funds in the HSA could not be carried over
- It was not recommended to me

Q8 [If Q6 = No]: How likely are you (your spouse/partner) to choose a HDHP insurance plan in the future if it was offered?

- Very likely
- Likely
- Not likely
- Don't know

Q9 [If Q6 = No]: Have you (your spouse/partner) had an HDHP insurance plan with an HSA in the past?

Participating in a high-deductible health plan generally allows you to contribute to a Health Savings Account (HSA). You can save money on a pre-tax basis in an HSA to pay for medical expenses. You can only contribute to an HSA if you participate in a high-deductible health plan. Employers may contribute to an employee's HSA as well. Funds contributed to a HSA in a given year do not have to be spent that year; they can be invested and/or used in subsequent years, even during retirement. In 2020, the HSA contributions limits were $3,550 under single coverage and $7,100 under family coverage.

- Yes
- No
- Don't know

Q10 [If Q6 = Yes]: Why did you (your spouse/partner) choose the HDHP insurance plan? (Choose all that apply)

- A high-deductible health plan was the only option
- Premiums were low
- Expected to incur high medical spending in 2020
- Expected to incur little medical spending in 2020
- For the tax benefits of the Health Savings Account
- It was recommended to me

Q11 [If Q6 $\neq$ No]: Do you (your spouse/partner) have an HSA account with the current employer-sponsored HDHP plan?

Participating in a high-deductible health plan generally allows you to contribute to a Health Savings Account (HSA). You can save money on a pre-tax basis in an HSA to pay for medical expenses. You can only contribute to an HSA if you participate in a High-deductible Health plan. Employers may contribute to an employee's HSA as well. Funds contributed to a HSA in a given year do not have to be spent that year; they can be invested and/or used in subsequent years, even during retirement.

- Yes
- No
- Don't know

Q12 [If Q11 = No]: Have you (your spouse/partner) had an HDHP insurance plan with an HSA in the past?

Participating in a high-deductible health plan generally allows you to contribute to a Health Savings Account (HSA). You can save money on a pre-tax basis in an HSA to pay for medical expenses. You can only contribute to an HSA if you participate in a High-deductible Health plan. Employers may contribute to an employee's HSA as well. Funds contributed to a HSA in a given year do not have to be spent that year; they can be invested and/or used in subsequent years, even during retirement.

- Yes
- No
- Don't know

Q13 [If Q12 = Yes]: Did you (your spouse/partner) contribute to the HSA in 2020?

- Yes
- No
- Don't know

Q14 [If Q12 = Yes]: How much was contributed to the HSA in 2020?

- Less than $500
- $500 to $900
- $1,000 to $2,999
- $5,000 or more
- Don't know

Q15 [If Q12 = Yes]: Why was that contribution amount chosen? Select the most appropriate response

- It was the most I could afford to contribute
- It was the maximum amount matched by employer
- Based on my (spouse's/partner's) deductible
- Based on expected out-of-pocket healthcare spending
- To maximize the tax benefits of the HSA account
- Other [insert response]

Q16 [If Q6 = Yes]: Did your (spouse's/partner's) employer contribute to the HSA in 2020?

- Yes
- No
- Don't know

Q17 [If Q16 = Yes]: How much did your (spouse's/partner's) employer contribute?

- Less than $500
- $500 to $999
- $1,000 to $1,449
- $1,500 to $1,999
- $2,000 or more
- Don't know

Q18 [If Q16 = Yes]: Did these contributions require matching HSA contributions from your or your spouse/partner?

- Yes
- No
- Don't know

Q19 [If Q12 = Yes]: How long have you (your spouse/partner) had the current HSA?

- Less than one year
- 1 to 4 years
- 5 to 9 years
- 10 year or more
- Don't know

Q20 [If Q6 $\neq$ No or Q11 = Yes]: What is your (spouse's/partner's) approximate current HSA balance?

- Less than $500
- $500 to $999
- $1,000 to $2,499
- $2,500 to $4,999
- $5,000 to $9,999
- $10,000 or more
- Don't know

Q21 [If Q6 $\neq$ No or Q11 = Yes]: Did you (spouse/partner) make withdrawals from your HSA in 2020 to pay for health care expenses?

- Yes, I withdrew everything
- Yes, I withdrew most of the money in the account
- Yes, I withdrew some of the money in the account
- No, I did not occur health expenses
- No, I incurred health expenses but paid using other funds
- Don't know

Q22 [If Q6 = Yes or Q11 = Yes]: How are your HSA funds invested?

- Cash or Money-market funds
- Primarily Bond Funds
- Primarily Equity Funds
- Roughly equal split between Bonds and Equities
- Don't know

Q23 [If Q6 = Yes or Q11 = Yes]: How do you (your spouse/partner) want to use your (spouse's/partner's) HSA account? [strongly agree to strongly disagree for each, 5-options]

- To pay for current year health care expenses
- To pay for health care expenses in the next 1-5 years
- To pay for health care expenses in the next 5-10 years

- To pay for health care expenses in retirement
- To pay for other expenses in retirement
- Other [free response]

In this final section was would like to ask you a few questions on financial wellness.

Q24: Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

- More than $102
- Exactly $102
- Less than $102
- Don't know
- Prefer not to say

Q26: Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?

- More than today
- Exactly the same
- Less than today
- Don't know
- Prefer not to say

Q27: How confident are you that you could come up with $2,000 if an unexpected need arose within the next month?

- I am certain I could come up with the full $2,000
- I could probably come up with $2,000
- I could probably not come up with $2,000
- I am certain I could not come up with $2,000
- Don't know

We thank you for your time spent taking this survey.

B Appendix: Additional Figures and Tables

Table B.1: Total Household Income and Retirement Assets

Household Income	(%)	Household Retirement Assets	(%)
Less than $25,000	0.6	Less than $50,000	7.1
$25,000 to $49,999	9.6	$50,000 to $99,999	6.7
$50,000 to $74,499	16.7	$100,000 to $149,999	6
$75,000 to $99,999	14.9	$150,000 to $199,999	5.8
$100,000 to $149,999	23.9	$200,000 to $499,999	19.8
$150,000 to $199,999	11.6	$500,000 to $999,999	16.3
$200,000 to $249,999	6.2	$1 million or more	22.0
$250,000 or higher	9.3	Don't know	8.9
Prefer not to answer	7.1	Prefer not to answer	7.6
N	1,710	*N*	1,714

Note: Table presents distribution of household income and household retirement assets among survey respondents. Respondents were asked to report approximate amounts.

Table B.2: Distribution of Financial Literacy of the Sample

Panel A. Individual questions	Interest	Inflation	Diversification	
Correct (%)	87.5	79.2	72	
Incorrect (%)	3.9	7.2	1.3	
Don't know (%)	7.4	12.0	24.8	
Prefer not to answer (%)	1.2	1.6	1.7	
Panel B. All questions combined	Zero	One	Two	Three
Number Answered Correctly (%)	6.5	10.1	22.0	61.3
N=1,707				

Note: Table reports the distribution of financial literacy among survey respondents. Panel A presents responses to each of the "Big 3" questions related to interest, inflation, and diversification. Panel B reports the percentage of respondents who correctly answer 0, 1, 2, or 3 questions correctly.

Table B.3: Distribution of Ability to Finance Emergency Expense

Response	(%)
Certain could come up with $2,000	76.2
Could probably come up with $2,000	13.8
Probably could not come up with $2,000	3.9
Certain could not come up with $2,000	4.2
Don't know	1.9
N=1,706	

Note: Table reports the distribution of responses to the question: "How confident are you that you could come up with $2,000 if an unexpected need arose within the next month?"

Table B.4: Joint Distribution of Financial Literacy and Liquidity Constraints

	Not liquidity constrained	Liquidity constrained	Total
Low financial literacy	519	137	656
High financial literacy	981	66	1,047
Total	1,500	203	1,703

Note: Table reports joint distribution of financial literacy with liquidity constraints among survey respondents. High financial literacy is defined as answering all three questions correctly, and low financial literacy is defined as answering at least one question incorrectly. Liquidity constrained is defined as either reporting they either probably could not or certainly could not come up with $2,000 within 30 days to finance an emergency expense, or having an outstanding 403(b) loan. There is a positive correlation between low financial literacy and liquidity constraints.

Table B.5: Covariate Balance

	F-stat	p-value
Employee-level characteristics		
Female	3.73	0.024
Age	2.56	0.078
Graduate degree	1.16	0.315
Faculty	0.66	0.516
University-level characteristics		
Number of plans	869.43	<0.001
HDHP actuarial value	273.26	<0.001
HDHP deductible	818.18	<0.001
HDHP out-of-pocket maximum	149.32	<0.001

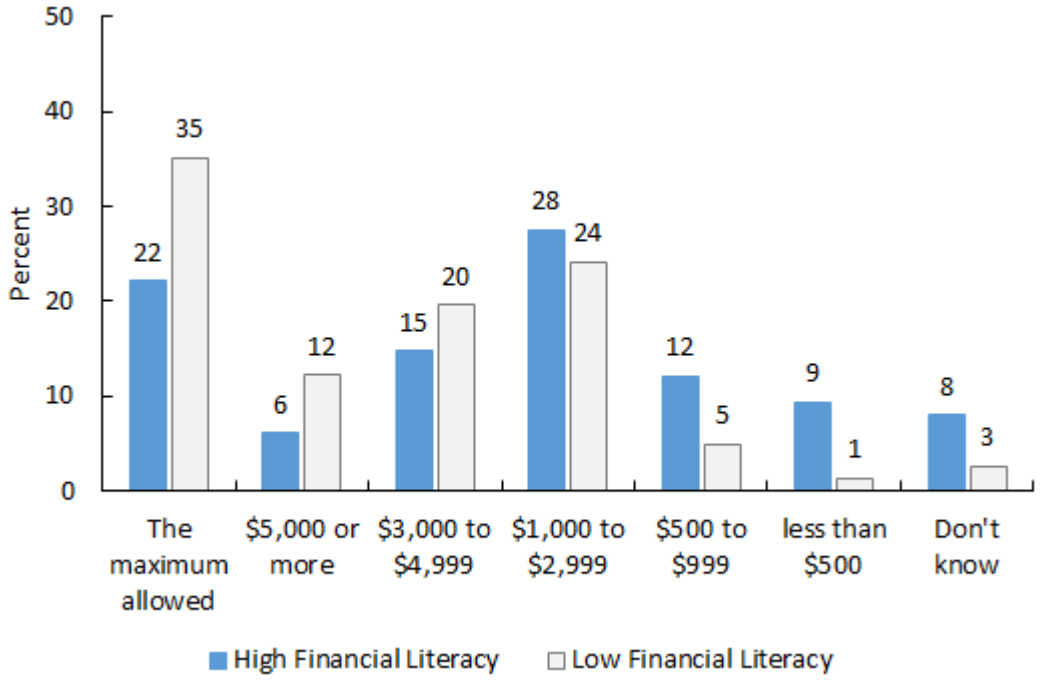
Note: Table presents the F-statistic and associated p-value from linear regressions of each covariate that is listed in rows against employee premiums in the HDHP and employer HSA contributions. Specifically, each row reports the results of running the following regression: $x_{ics} = a + \alpha_0 p_{cs} + \alpha_1 h_{cs} + u_{ics}$, where x_{ics} is an observable characteristic for individual i with coverage type c at employer s. The table reports the p-value from the F-statistic that $\alpha_0 = \alpha_1 = 0$, with each row corresponding to a separate regression. In terms of individual-level covariates, employee HDHP premiums and HSA contributions are not correlated with employee education or employee type (faculty vs. staff), but are correlated with gender and age. Premiums and HSA premiums are correlated with other features of the health insurance plan environment, such as number of plans, actuarial value of the HDHP, HDHP deductible, and HDHP out-of-pocket maximum.

Table B.6: Conditional Logit Results: Sub-Samples

	(1)	(2)	(3)	(4)	(5)
β_0, Employee Premium (hundreds)	-0.381*** (0.064)	-0.350*** (0.040)	-0.257*** (0.052)	-0.338*** (0.045)	-0.386*** (0.077)
β_1, Employer HSA contribution (hundreds)	-0.006 (0.033)	-0.007 (0.022)	0.006 (0.029)	0.049 (0.027)	-0.043 (0.049)
β_2, Expected out-of-pocket costs (hundreds)	-0.025* (0.012)	-0.006 (0.008)	-0.046*** (0.012)	0.005 (0.011)	-0.012 (0.012)
β_3, Var. of out-of-pocket costs ($\times 10^6$)	0.043 (0.039)	-0.008 (0.028)	0.107** (0.040)	-0.095** (0.035)	-0.023 (0.054)
β_4, Deductible (hundreds)	-0.304*** (0.029)	-0.309*** (0.019)	-0.286*** (0.022)	-0.303*** (0.023)	-0.347*** (0.032)
β_5, Out-of-pocket limit (hundreds)	-0.044*** (0.011)	-0.048*** (0.007)	0.018* (0.009)	-0.069*** (0.009)	-0.092*** (0.016)
Sample	Faculty	Salary \$60k+	Ages 20-34	Ages 35-54	Ages 55+
NT	45,184	110,324	72,663	76,740	61,457
p-value of test $\beta_0 = -\beta_1$:	<0.001	<0.001	<0.001	<0.001	<0.001

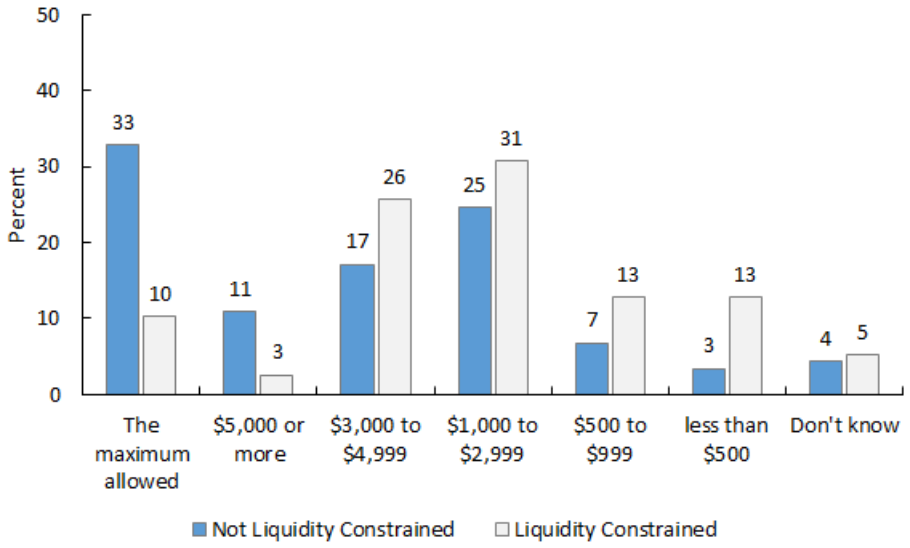
Note: Table shows results of conditional logit models estimated in Equation 3. Coefficients estimates reported are the parameters of the utility function, not marginal effects. R Regressions also indicators for salary bins ($20,000), age (5-years), gender, academic vs. medical division, faculty, above-median tenure, and lags of previous plan choices. Standard errors clustered by employee reported in parentheses.

Figure B.1: Distribution of HSA Contributions by Financial Literacy



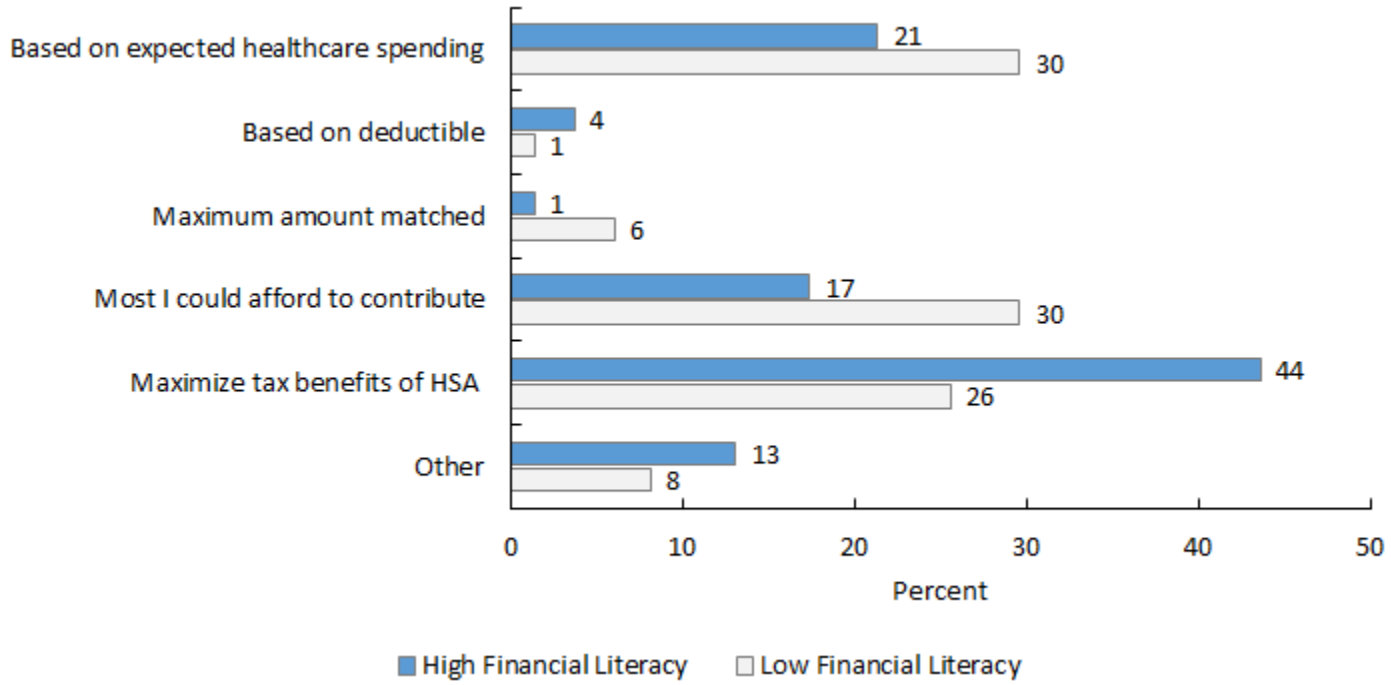
Notes: Percentages shown. χ^2 test, p$\leq$0.001

Figure B.2: Distribution of HSA Contributions by Liquidity Constraints



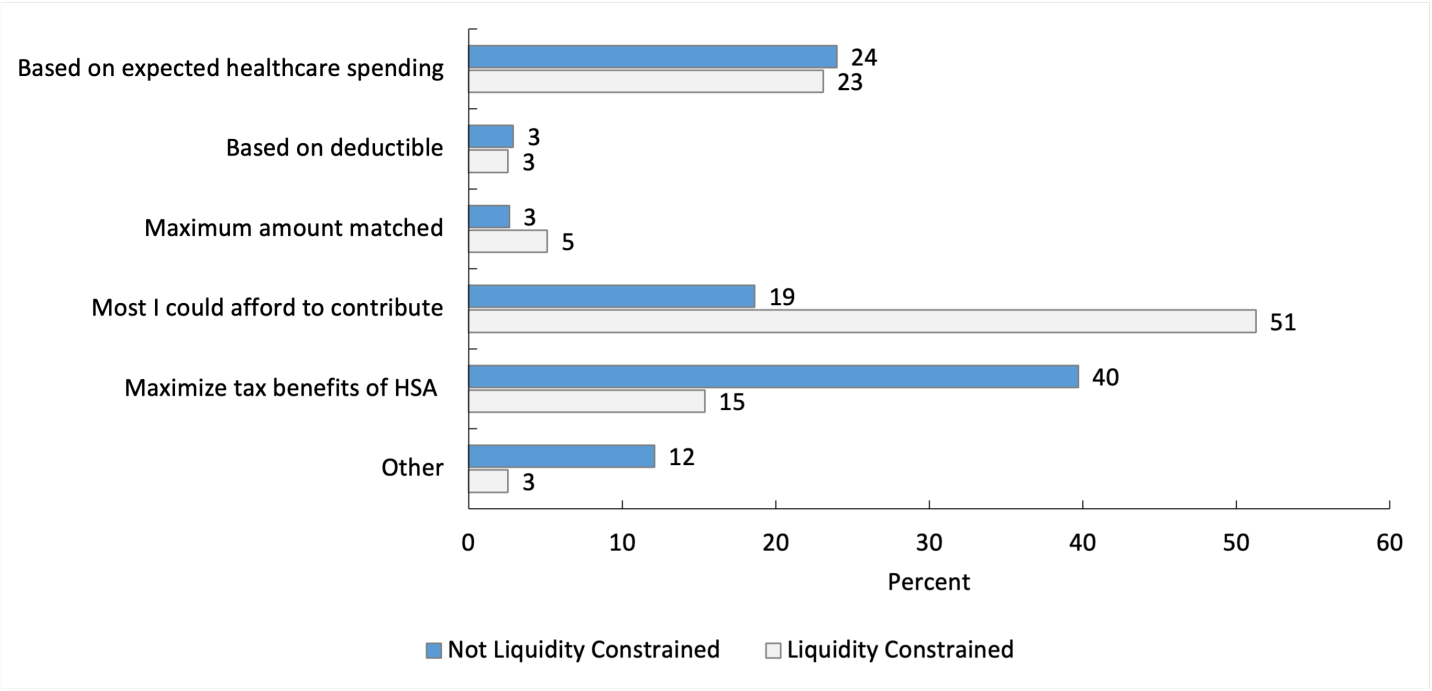
Notes: Percentages shown. χ^2 test, p = 0.003

Figure B.3: Why Chose HSA Contribution Amount by Financial Literacy



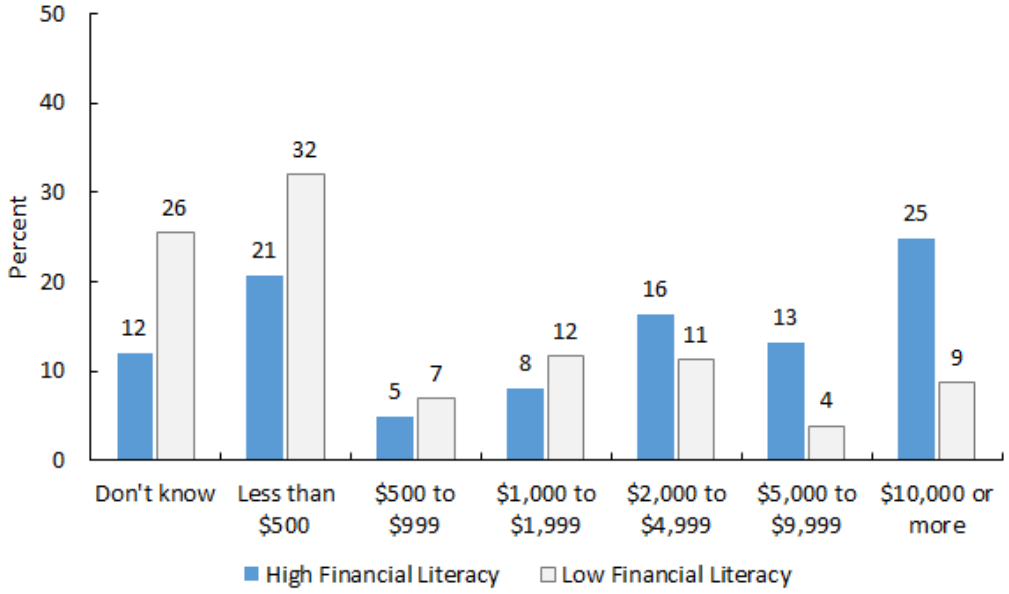
Notes: Percentages shown. χ^2 test, p≤0.001

Figure B.4: Why Chose HSA Contribution Amount by Liquidity Constraints



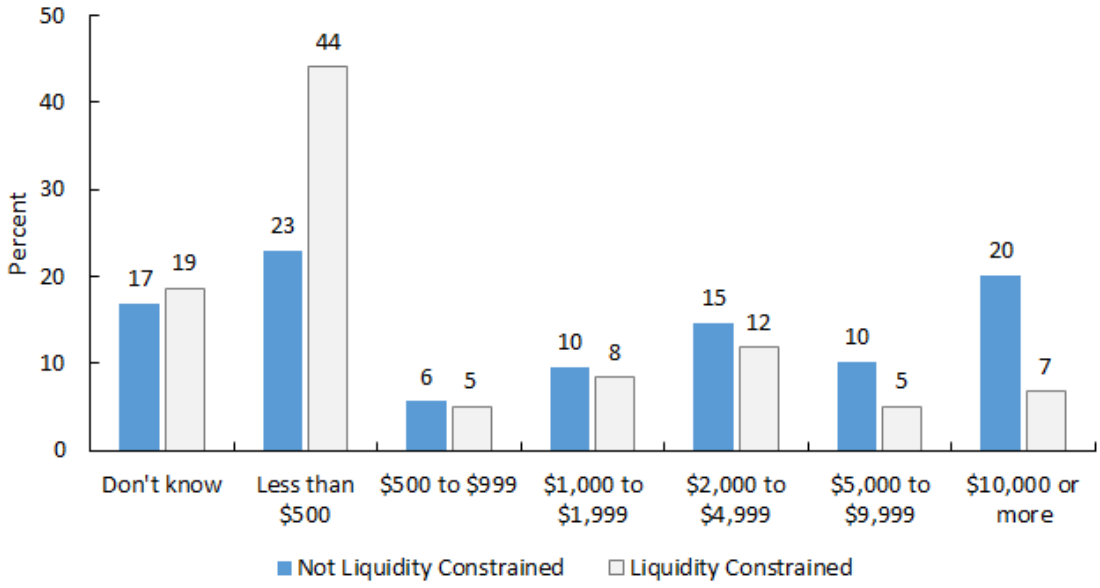
Notes: Percentages shown. χ^2 test, p≤0.001

Figure B.5: Distribution of HSA Balances by Financial Literacy



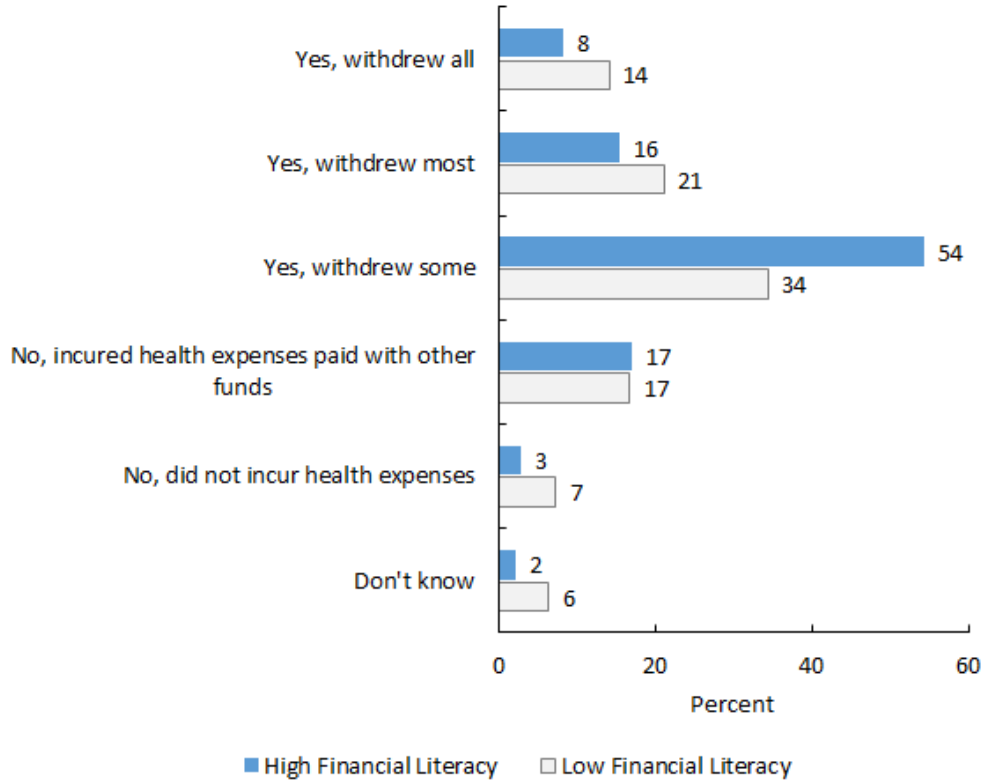
Notes: Percentages shown. χ^2 test, p < 0.01

Figure B.6: Distribution of HSA Balances by Liquidity Constraints



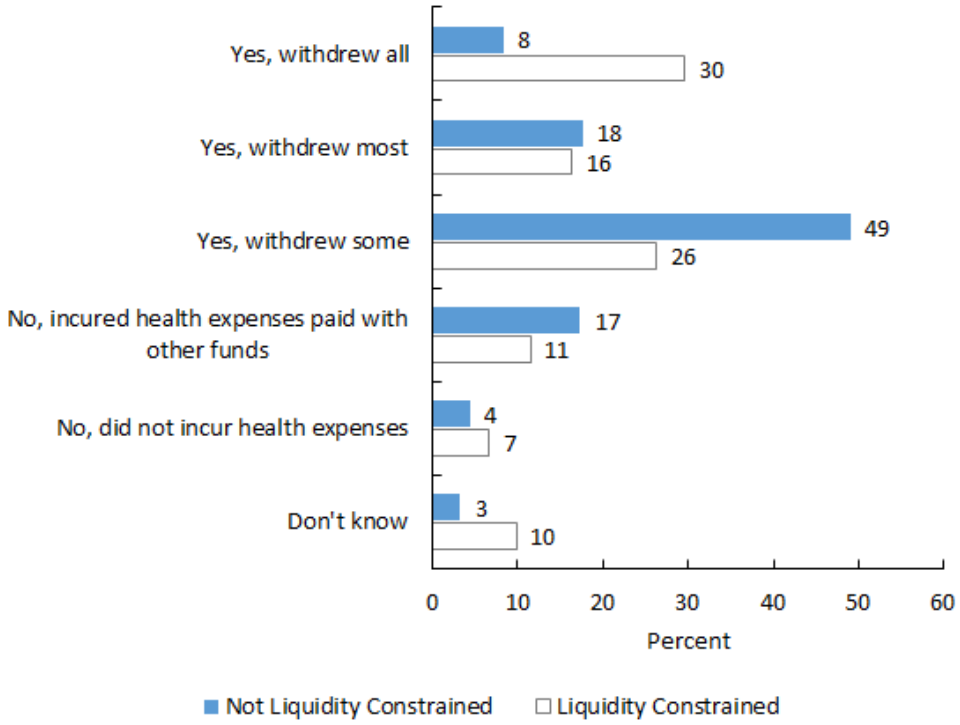
Notes: Percentages shown. χ^2 test, p = 0.010

Figure B.7: Distribution of HSA Withdrawals by Financial Literacy



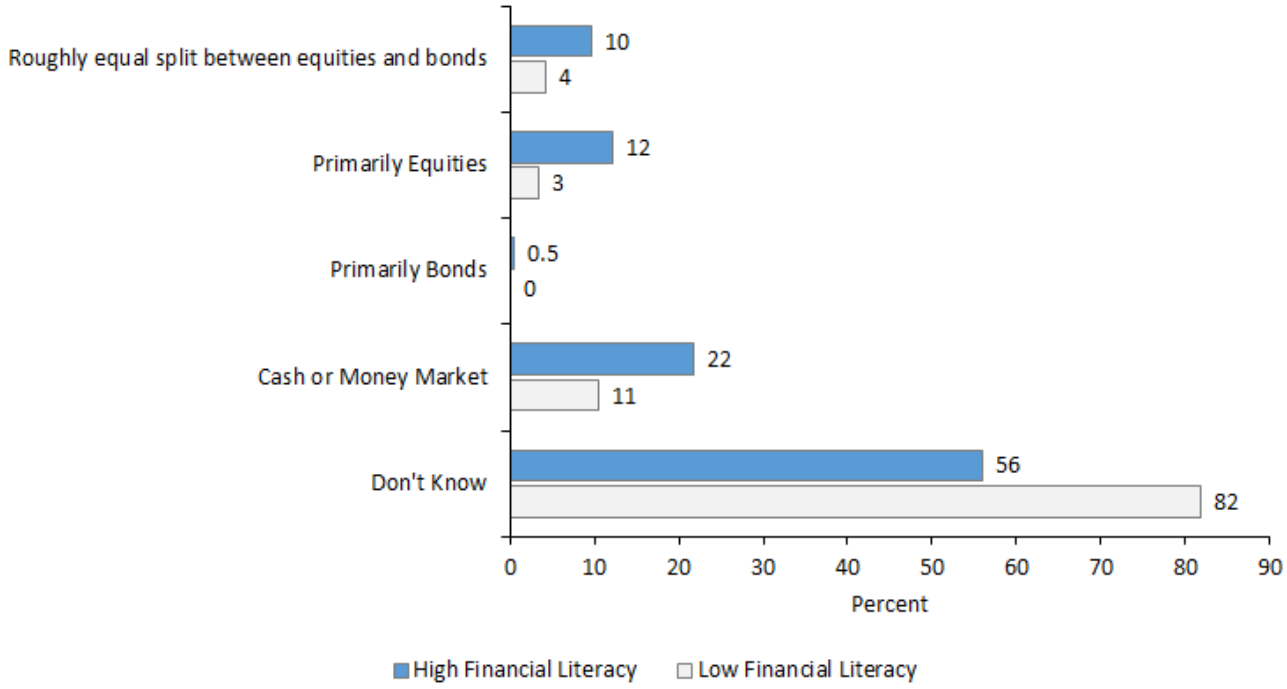
Notes: Percentages shown. χ^2 test, $p < 0.001$

Figure B.8: Distribution of HSA Withdrawals by Liquidity constraints



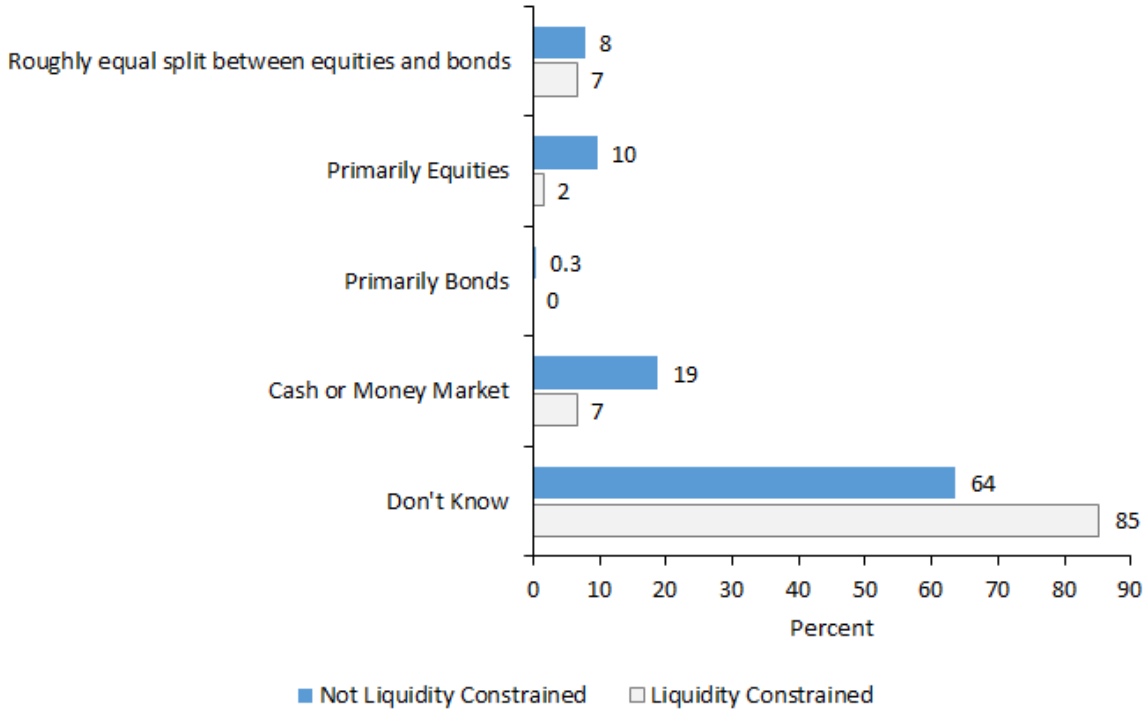
Notes: Percentages shown. χ^2 test, p < 0.001

Figure B.9: How HSA Funds Invested by Financial Literacy



Notes: Percentages shown. χ^2 test, p$\leq$0.001

Figure B.10: How HSA Funds Invested by Liquidity Constraints



Notes: Percentages shown. χ^2 test, p = 0.012

Table B.7: Heckman Selection Models of HSA Behavior

	Contributed $3,000 or more	Chose contribution to maximize tax benefits	HSA balance over $2,000	Withdrew all or most of HSA	Unsure how HSA balance is invested
	(1)	(2)	(3)	(4)	(5)
High financial literacy	0.128	0.093	0.596**	-0.492***	-0.665***
	(0.180)	(0.071)	(0.243)	(0.129)	(0.158)
Liquidity constrained	-0.400	-0.039	-0.477**	0.667***	0.490*
	(0.366)	(0.106)	(0.187)	(0.205)	(0.262)
ρ	-0.866	-14.761***	1.408	-0.622	-0.055
	(0.712)	(1.439)	(1.741)	(0.816)	(0.829)
N	1,388	1,537	1,460	1,464	1,465

Note: Table shows results of maximum likelihood probit models using sample selection corrections. High financial literacy is defined as answering all three financial literacy questions correctly. Liquidity constraints are defined as either (1) having an outstanding 403(b) loan, or (2) reporting they certainly could not or probably could not come up with $2,000 in 30 days to finance an expected expense. Regressions also include an indicator for employee-only coverage and a constant. Standard errors in parentheses. *** $p<0.01$, ** $p < 0.05$, * $p<0.1$.

Table B.8: LPMs: HSA Contributions of $3,000 or more

	(1)	(2)	(3)	(4)
High financial literacy	0.080*		0.096*	
	(0.049)		(0.050)	
Liquidity constraint	-0.191**		-0.168**	
	(0.082)		(0.084)	
Employer HSA contribution	-0.222***	-0.222***		
	(0.079)	(0.079)		
Employee-only coverage	-0.069	-0.069	-0.049	-0.050
	(0.047)	(0.047)	(0.049)	(0.049)
Reference group (High financial literacy & not constrained)				
High financial literacy & liquidity constraint		-0.165		-0.112
		(0.118)		(0.121)
Low financial literacy & no constraint		-0.076		-0.086
		(0.051)		(0.053)
Low financial literacy & liquidity constraint		-0.290***		-0.305***
		(0.109)		(0.111)
Constant	0.507***	0.585***	0.309	0.387
	(0.086)	(0.078)	(0.273)	(0.269)
Employer Fixed Effects	No	No	Yes	Yes
N	430	430	430	430

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports regression results of linear probability models (LPMs) in which the dependent variable is an indicator of employee HSA contributions of $3,000 or more to the HSA. Columns (1) and (3) include indicators for financial literacy and liquidity constraints without an interaction. Columns (2) and (4) include interactions of financial literacy and liquidity constraints and report combinations of each type, with the reference group being those with high financial literacy who are not liquidity constrained. Robust standard errors in parentheses.

Table B.9: LPMs: Chose HSA contribution to maximize tax benefit

	(1)	(2)	(3)	(4)
High financial literacy	0.138***		0.149***	
	(0.039)		(0.040)	
Liquidity constraint	-0.153**		-0.132**	
	(0.063)		(0.063)	
Employer HSA Contribution	-0.149**	-0.149**		
	(0.063)	(0.063)		
Employee-only coverage	-0.001	-0.001	0.003	0.003
	(0.039)	(0.039)	(0.039)	(0.039)
Reference group (High financial literacy & no constraint)				
High financial literacy & liquidity constraint		-0.085		-0.046
		(0.093)		(0.095)
Low financial literacy & no constraint		-0.124***		-0.132***
		(0.042)		(0.042)
Low financial literacy & liquidity constraint		-0.333***		-0.333***
		(0.081)		(0.081)
Constant	0.345***	0.478***	0.173	0.304*
	(0.068)	(0.062)	(0.159)	(0.157)
Employer Fixed Effects	No	No	Yes	Yes
N	585	584	584	584

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table presents regression results of linear probability models in which the dependent variable is an indicator of whether the employee reported making their HSA contribution to maximize the tax benefits. Columns (1) and (3) include indicators for financial literacy and liquidity constraints without an interaction. Columns (2) and (4) include interactions of financial literacy and liquidity constraints and report combinations of each type, with the reference group being those with high financial literacy who are not liquidity constrained. Robust standard errors in parentheses.

Table B.10: LPMs: HSA Balance of $2,000 or more

	(1)	(2)	(3)	(4)
High financial literacy	0.247***		0.272***	
	(0.047)		(0.048)	
Liquidity constraint	-0.155**		-0.158**	
	(0.078)		(0.079)	
Employer HSA contribution	-0.069	-0.070		
	(0.078)	(0.078)		
Employee-only coverage	0.056	0.056	0.042	0.042
	(0.046)	(0.046)	(0.047)	(0.047)
Reference group (High financial literacy & no constraint)				
High financial literacy & liquidity constraint		-0.210*		-0.223**
		(0.111)		(0.113)
Low financial literacy & no constraint		-0.295***		-0.282***
		(0.049)		(0.050)
Low financial literacy & liquidity constraint		-0.397***		-0.380***
		(0.104)		(0.105)
Constant	0.372***	0.662***	-0.173	0.116
	(0.084)	(0.076)	(0.244)	(0.242)
Employer Fixed Effects	No	No	Yes	Yes
N	504	504	504	504

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports regression results of linear probability models in which the dependent variable is an indicator of the employee reporting an HSA balance of $2,000 or more. Columns (1) and (3) include indicators for financial literacy and liquidity constraints without an interaction. Columns (2) and (4) include interactions of financial literacy and liquidity constraints and report combinations of each type, with the reference group being those with high financial literacy who are not liquidity constrained. Robust standard errors in parentheses.

Table B.11: LPMs: Withdrew most or all of HSA balance

	(1)	(2)	(3)	(4)
High financial literacy	-0.161***		-0.148***	
	(0.042)		(0.043)	
Liquidity constraint	0.222***		0.231***	
	(0.069)		(0.070)	
Employer HSA contribution	0.037	0.036		
	(0.070)	(0.070)		
Employee-only coverage	-0.115***	-0.115***	-0.102**	-0.102**
	(0.041)	(0.041)	(0.042)	(0.042)
Reference group (High financial literacy & not constrained)				
High financial literacy & liquidity constraint		0.179*		0.190*
		(0.097)		(0.100)
Low financial literacy & no constraint		0.152***		0.140***
		(0.044)		(0.045)
Low financial literacy & liquidity constraint		0.417***		0.411***
		(0.093)		(0.095)
Constant	0.364***	0.206***	0.579***	0.443**
	(0.075)	(0.068)	(0.220)	(0.219)
N	508	508	508	508

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table presents regression results of linear probability models (LPMs) in which the dependent variable is an indicator of whether the employee reported withdrawing most or all of their HSA balance in the last year. Columns (1) and (3) include indicators for financial literacy and liquidity constraints without an interaction. Columns (2) and (4) include interactions of financial literacy and liquidity constraints and report combinations of each type, with the reference group being those with high financial literacy who are not liquidity constrained. Robust standard errors in parentheses.

Table B.12: LPMs: Don't know how HSA funds are invested

	(1)	(2)	(3)	(4)
High financial literacy	-0.234***		-0.227***	
	(0.046)		(0.047)	
Liquidity constraint	0.146*		0.145*	
	(0.075)		(0.077)	
Employer HSA contribution	0.220***	0.220***		
	(0.076)	(0.076)		
Employee-only coverage	-0.050	-0.050	-0.047	-0.047
	(0.045)	(0.045)	(0.046)	(0.046)
Reference group (High financial literacy & not constrained)				
High financial literacy & liquidity constraint		0.193*		0.192*
		(0.106)		(0.109)
Low financial literacy & no constraint		0.243***		0.236***
		(0.048)		(0.049)
Low financial literacy & liquidity constraint		0.343***		0.334***
		(0.102)		(0.104)
Constant	0.566***	0.328***	0.646***	0.405*
	(0.082)	(0.075)	(0.241)	(0.239)
Employer Fixed Effects	No	No	Yes	Yes
N	509	509	509	509

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports regression results of linear probability models (LPMs) in which the dependent variable is an indicator that the employee reported being unsure or did not know how their HSA balances were invested. Columns (1) and (3) include indicators for financial literacy and liquidity constraints without an interaction. Columns (2) and (4) include interactions of financial literacy and liquidity constraints and report combinations of each type, with the reference group being those with high financial literacy who are not liquidity constrained. Robust standard errors in parentheses.

C Appendix: Actuarial values and distributions of health expenditures

Actuarial values: In health insurance, the generosity of the plan is often summarized by its Actuarial Value (the fraction of total health spending that is covered by the plan, exclusive of premiums). Higher numbers mean more generous coverage (lower out-of-pocket payments) and lower actuarial values mean less generous coverage (higher out-of-pocket payments). The Center for Consumer Information and Insurance Oversight (CCIIO) has produced a tool that takes the various plan parameters (deductibles, copays, etc.) and calculates the actuarial value for the plan. Using the plan information for each school that was available online, we calculated the actuarial values for each plan to characterize how generous the different options are.

Construction of health expenditure distributions : In the conditional logit analysis of the case study, we include the mean and variance of out-of-pocket costs. This section details the procedure for constructing distributions of out-of-pocket costs for each employee and dependents. The approach is based on grouping people into "risk groups" according to demographics and previous health spending, and then using the empirical distribution of out-of-pocket (OOP) payments among people in each risk group as a measure of beliefs. We first divide each insured individual according to discrete age bins (younger than 30, 30–39, 40–49, 50–59.5, 59.5 and older) and gender (male, female). Within these groups, we further split into terciles based on 1-year lags of total health spending, combining both plan paid spending and OOP spending. We classify people with the same grouping of age, gender, and cost tercile as being in the same risk group. To construct the distribution of out-of-pocket spending under plan j for people in risk group g, we take the distribution of observed spending of people within risk group g who chose plan j. We assign this distribution to people in risk group g who chose a different plan $k \neq j$.

To give an example, we group women aged 30–39 together, rank them by their total health spending in year $t-1$, and divide them evenly into three sub-groups (terciles) based on year $t-1$ spending. Within each tercile, we further split them based on their observed plan choice (low coverage, medium coverage, or high coverage) in year t. The empirical distribution of OOP for each of the three coverage levels is taken as the OOP distribution for each woman in that sub-group if she had chosen that coverage level.

The final step is to combine OOP distributions of each family member. We implement this by taking 500 draws for each employee or dependent from their group-specific OOP distribution under each plan, and sum each of the 500 draws across all family members to arrive at a distribution of OOP costs for the family. If the sum of OOP within families for any draw exceeds the plan's OOP max, we replace the OOP for that draw as the OOP max. This distribution of 500 OOP draws represents the family's belief about OOP risk under each available plan.

In constructing each OOP distribution, we pool multiple years together. Doing so ensures that each risk group based on age, gender, lagged cost tercile, and plan choice has a sufficiently large number of individuals. The only plans and years for which we construct distributions from a single year of data are the high coverage and medium coverage plans

in 2014. Starting in 2015, the deductibles increased for these plans, raising average OOP spending by about $100. We pool 2015–2017 for constructing distributions for the medium coverage and high coverage plans in these years. Since cost sharing in the low coverage plan remained roughly constant with the exception of a slight rise in the OOP max, we pool 2014–2017 in generating OOP distributions in the low coverage plan.