

# Investment defaults and retirement savings allocations\*

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## Abstract

In 2006, the University of Iowa retirement plan default investment changed from a money market fund to a target date fund (TDF). We study how this affected participant choices using a unique data set that combines TIAA administrative data and University of Iowa human resources data. We show that the structure of the investment default significantly affects default take-up, the “stickiness” of the default, and the contribution allocations of all participants. Relative to employees who joined under the TDF default, those who joined under the money-market default were less likely to accept the default, moved away from it rapidly if they did accept it, and their overall contribution had a lower average percentage of equity. We further explore the factors driving differences in behavior and outcomes by combining our merged data with microdata from an experiment conducted with a subset of participants. This indicates that employees with greater financial knowledge and/or experience are less likely to use the default, customizing their investment portfolio instead.

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# 1 Introduction

Defined contribution (DC) retirement plans typically allow employees to make decisions that can affect their lifetime financial security. These include: whether to participate, how much to contribute, how to allocate their funds across assets, and how to take retirement distributions. These are complicated decisions with consequences that may become evident only decades later. In response to these difficulties, most DC plans incorporate a set of rules that include default participation, a default minimum level of contributions, and a default investment fund. Beginning with Madrian and Shea (2001), several studies have shown that these plan default provisions increase retirement plan participation and that defaulting participants tend to stick with default contribution amounts. The effect of the default investment fund on participant behavior is less well-documented, especially since the 2006 codification of target date funds (TDFs) as a qualified default investment alternative.

We exploit a natural experiment to study the behavioral effects arising from different types of default investment funds. In 2006, the University of Iowa changed its DC plan default investment from a money market fund to a TDF. Money market funds hold a mixture of cash and short-term bonds but contain no equity component. By comparison, TDFs hold a mixture of equity and bond funds. Typically TDFs have 75% or more invested in equity (for younger participants) with the equity weight determined by the participant's age. Using a unique data set combining TIAA administrative data with University of Iowa HR data, we study the behavior of employees who joined the retirement plan before and after the change in default. We examine how the change in the menu default fund impacts behavior, specifically whether participants accept the default allocation or customize their portfolio, and whether participants allocate different percentages to equity when the default changes. Our results indicate the structure of the investment default has significant effects on default take-up, the “stickiness” of the default, and asset allocations of all participants. We further explore the factors driving differences in behavior and outcomes by combining our merged data with the microdata from an experiment with a subset of participants. These results indicate that employees with greater financial knowledge and/or experience are less likely to use the default, customizing their investment portfolios instead. Overall, we find strong evidence that the structure of the investment default affects all participants, regardless of whether or not they use the default.

In theory, the retirement plan default fund should not change behavior because it does not alter the optimal asset allocations for participants nor does it alter investment opportunities. However, several prior studies document “default effects.” Madrian and Shea (2001) find that automatically enrolling employees in a 401(k) plan (opting out requires an active choice)

significantly increases enrollment in the plan. Further, most new employees (61.1%) contribute at the default rate and allocate their investment exclusively to the default money market fund. Choi et al. (2002) echo these findings, analyzing three plans with 54.5% to 72.6% of participants allocating exclusively to the default option six months after joining the plan.<sup>1</sup> As Choi et al. (2002, 70) state: “Employer choices of default saving rates and default investment funds strongly influence employee savings levels. Even though employees have the opportunity to opt out of such defaults, few actually do so.” Because “almost always, the easiest thing to do is nothing whatsoever, a phenomenon that we call passive decision.” Madrian and Shea (2001, 1174) document default “stickiness” in the sense that “even after one year, over half of the 401(k) participants hired under automatic enrollment are at the default, and after two years, 40 percent are still at the default.” Choi et al. (2002, 80) show almost half of participants are still “stuck” at the default after 3 years of participation.

Our analysis differs from prior work because we study behavior under two different default options at the same employer: a money market default (MMD) versus a target date default (TDD).<sup>2</sup> We also study employee behavior in a different setting and slightly later time period. The default change creates a natural experiment because there is no reason to believe there are significant differences in the employees or participants as a result of this exogenous change. To expedite discussion, we define two types of participants and regimes: (1) the “MMD participants” who made their first contribution when the money market fund was the default (the “MMD regime”) and (2) “TDD participants,” who joined TIAA when a target date fund was the default, during the “TDD regime.”<sup>3</sup> To study who is more or less prone to default effects, we combine allocation data with other human resources (HR) data about participants and experimental data for a subset of participants.

Using this data, we contribute to existing research on retirement plan defaults by examining the following questions:

1. Does the default option affect the likelihood of participants allocating exclusively to the default investment when they join the plan (i.e., initially default into it)?
2. Does the default option affect the “stickiness” of the default (i.e., how fast do participants move out of it and customize their portfolios)?
3. What types of participants are more likely to default into an allocation and stick with the default?

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<sup>1</sup>See also Choi et al. (2003) and Choi et al. (2004).

<sup>2</sup>In our data, the contribution rate is fixed for all participants. So, we study default effects related to fund choices and asset allocation, but not related to the contribution rate.

<sup>3</sup>We measure the “joined” date as the date of the first contribution. As a practical matter, this occurred shortly after being hired.

4. Does the default option affect the overall contribution allocations of participants to different asset classes?
5. Does experimental data collected on a subset of subjects explain behavior?

We refer to a participant as a “defaulter” if they invest 100% in the default fund when they first contribute. While many participants initially default with their first contribution, not all defaults are equal. Initially, the money market default attracts a similar percentage of participants compared to prior research: 61.4% of MMD participants defaulted into the money market fund with their first contribution. However, in our sample, the money market default is less sticky than observed in prior research. After three months, more than 95% of initial defaulters had customized their allocations. In contrast, the target date fund is more attractive and sticky: 90.7% of TDF participants initially defaulted into it and nearly 2/3 of these participants were investing exclusively in the target date fund three years later.

Next, under each default, we use human resources data to ask what types of participants are more likely to take the default and remain with it six months later. For participants who join under the money market default, there is a non-linear relationship between age and initial defaults but, generally, older participants are somewhat more likely to default. Participants with higher contributions are less. However, six months later, there remain no significant demographic effects for MMD participants; nearly all customize their portfolios within six months. Higher contribution participants who join under the target date default are less likely to default initially. Demographic factors explain which TDD participants customize their portfolios within six months. There is a nonlinear relationship with age, but generally, older participants are more likely to customize as are participants employed by the College of Business. Faculty members are more likely to remain in the TDD.

Third, we document how overall equity exposures vary with the default regime.<sup>4</sup> A MMD participant who defaulted into the money market fund and continued with it would have no equity exposure in their allocations. But this is rare. Nearly all MMD participants customize their portfolios within a few months of joining. Older participants generally allocate less to equity while participants with larger contributions and those in the College of Business allocate more. In contrast, many fewer TDD participants customize their portfolios. This results in a higher overall equity exposure that decreases with age. Joining in the TDD regime, however, essentially eliminates all demographic effects on equity exposure except for age.

Next, we look at the differences in allocations between (1) participants who defaulted and

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<sup>4</sup>By equity exposure, we mean the fraction of a participant’s contribution allocated to equity.

remain in the default over time, (2) those who initially defaulted, but have since customized their portfolios and (3) those who never defaulted. MMD participants who initially default and remain in the money market default have no equity exposure. Most customize their portfolios within a few months, leading to dramatically higher equity exposures. Equity exposures are greatest among MMD participants who never defaulted. In contrast, TDD participants who initially default and remain in the target date fund have high equity exposures. Those who customize after defaulting on average decrease their equity exposure, although their equity exposure is higher than for TDD participants who customized their portfolios immediately. Overall, equity exposure for MMD participants is less than for TDD participants. This suggests that there may be an anchoring effect (Chapman and Johnson (2002)).

Finally, we find significant correlations between behaviors and financial knowledge measured by a short quiz and self-reported financial experience. TDD participants with higher knowledge are significantly more likely to customize their portfolios initially or within six months of joining the plan. The same holds true for participants with high reported financial experience. While there is little difference in equity exposures between high and low knowledge participants, MMD participants who report higher experience allocate more to equity when they customize.

Documenting default effects on portfolios has potentially important policy implications for pension plan sponsors. We frame our results in the context of a Capital-Labor-Production (CLP) framework for decision making (Camerer and Hogarth (1999)). In our setting, this framework implies that participants will make the “passive choice” (accepting the default) when the default option is reasonably close to their optimal choice or when making an active choice requires too much effort. This framework can explain behavior differing across defaults. We do not find that participants accept the default simply because it is easy, as suggested by prior research (e.g., Choi et al. (2002)). Instead, our evidence is consistent with the CLP framework, which predicts that participants actively choose portfolios when (1) their optimal portfolios differs significantly from the default, (2) when they have more at stake, and (3) when they are more capable of making an informed choice that has a significant impact. If not, they choose the default option. This helps inform policy and creates opportunities for plan administrators to affect choices in predictable ways as we discuss in our concluding remarks.

In the next section, we review the literature. Then, we describe the data and present results in the next two sections. We discuss our results in the final section.

## 2 Literature

Benartzi and Thaler (2007) survey much of the related research, so we will be brief here.

Choi et al. (2002) and Choi et al. (2004) document “default effects” in retirement plan participant behavior. Briefly, they document:

- Employees often do nothing, accepting the plan’s default options. They call this the “passive” default decision.
- Requiring participation increases participation rates.
- Default effects create larger behavioral outcomes than financial education.

Similarly, Madrian and Shea (2001) observe that employees who join a plan after an enrollment default takes effect are more likely to participate and use the default investment option than employees who joined before the default.

Researchers debate the benefits and optimality of defaults. It is well understood that participant heterogeneity means there is no single optimal savings plan.<sup>5</sup> Basu, Chen, and Clements (2014) question the value of target date funds as default options specifically. Choi et al. (2003) develop a trade-off theory to explain when participants might opt out of a default. They argue that, if participants “share a common optimal savings rate, selecting an optimal default is trivial” (p. 180). But, if participants have heterogeneous optimal savings rates, a company may want to implement a default that is so bad that it incentivizes employees to make an active choice. Beshears et al. (2010) do indeed find that participants are less likely to stick with an obviously sub-optimal default contribution rate.<sup>6</sup>

We do not claim that either of the defaults we study are optimal. Our results are consistent with a combination of two ideas: (1) generally, “lifecycle funds are vastly superior to money market funds” (Basu, Chen, and Clements (2014, 51)) and (2) participants are more likely to opt out of defaults that they view as suboptimal (Choi et al. (2003)). As discussed above, our evidence is consistent with the CLP framework of Camerer and Hogarth (1999), which implies that acceptance or rejection of the default depends on the optimality of the default, the importance of the choice, and the effort needed to make an active choice.

Perhaps the work most closely related to ours is Beshears et al. (2009), who study behavior for employees that were hired before and after an automatic enrollment default was established. They find a significant increase in participation after participation became the

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<sup>5</sup>For example, “the existence of heterogeneity argues against impersonal default rules” (Sunstein (2013), p. 2). Sunstein goes on to argue that poorly chosen rules can be extremely harmful.

<sup>6</sup>Cronqvist and Thaler (2004) also show that actively discouraging a default choice can lead to fewer participants choosing it (only 33.1% in their case).

default. Employees who joined after the default frequently contributed at exactly the default contribution rate and often exclusively in the default fund which, in one case, was a money market fund. Like Beshears et al. (2009), we study behavior of employees that were hired before and after a change. However, we look at the effects of changing the default fund from a money market fund to a target date fund. Like Beshears et al. (2009), we find that many participants who join under a money market default initially allocate exclusively to the money market default. However, we find that participants move away from the money market default relatively quickly. This contrasts with behavior for participants who join under a target date default. They are much more likely to invest exclusively in the default fund and stick with it.

### 3 Data

The data for this paper combines TIAA administrative data on retirement contribution allocations, human resources data and experimental data collected from University of Iowa employees. Table 1 summarizes the data.

The TIAA data (Panel A) includes 1,519,538 contribution allocations by University of Iowa (UI) employee participants from July 2002 through December 2010. These contributions are made by 22,616 unique individuals. The average number of observations per participant is 67 (5 years and 7 months of contributions). We know the default investment option for all of these participants when they joined, but we observe the first allocation only for the 7,493 participants who joined during our sample period. Of these, 40% joined when the default investment was a money market fund (MMD) and the remainder when the default was a target date fund (TDD). For those for whom we have observations at six months, 43% joined under the money market default and 57% joined under the target date default. Thus, our sample of new participants is relatively balanced. We know whether the participants invested in the default with their first contribution (Defaulter Dummy) and their contributions to money market funds (i.e., percent allocated to money market funds). Similarly, we know their contribution to target date funds and to equity more generally (including the equity allocations within target date and other mixed funds). We know the participant's age.

We match participants with UI human resources data (Panel B) to understand how participant characteristics affect behavior. This data includes participant gender, marital status, whether they are faculty and whether they are employed in the College of Business.

We also have some experimental data on 543 participants (Panel C) who participated in the experiment described in McDonald and Rietz (2017). Of these, 202 joined during our sample

period, 77 under the money market default and 125 under the target date default. For these subjects, we know whether they were willing to wager \$1 in an actuarially fair bet paying 0 or \$2. We also have measures of their financial knowledge and self-reported financial experience.

Table 1: Summary statistics

Variable	All participant months				Participants with first contribution in data set				Participants with first and six-month contributions in data set			
	Mean	Med.	Std. Dev.	Obs.*	Mean	Med.	Std. Dev.	Obs.*	Mean	Med.	Std. Dev.	Obs.*
Panel A: TIAA Data												
Number of Observations per Participant	67.16	74.00	41.68	1,519,538	38.46	33.00	28.92	7,493	43.03	36.00	27.84	6,754
Joined after Target Date Default Dummy	0.09	0.00	0.29	1,519,538	0.60	1.00	0.49	7,493	0.57	1.00	0.50	6,754
Defaulter Dummy (1 = initial default)	N/A	N/A	N/A	N/A	0.78	1.00	0.41	7,493	0.77	1.00	0.42	6,754
Money Market Exposure in Allocation	0.03	0.01	0.09	1,519,538	0.10	0.03	0.21	7,493	0.04	0.03	0.08	6,754
Target Date Exposure in Allocation	0.09	0.00	0.28	1,519,538	0.51	1.00	0.50	7,493	0.46	0.00	0.49	6,754
Equity Exposure in Allocation	0.64	0.71	0.31	1,519,538	0.65	0.75	0.30	7,493	0.69	0.75	0.25	6,754
Participant Age	44.99	46.00	11.34	1,519,538	33.28	31.00	10.26	7,493	33.89	32.00	10.27	6,754
Panel B: University of Iowa HR Data												
Gender (1=Female)	0.62	1.00	0.48	1,519,538	0.66	1.00	0.47	7,493	0.66	1.00	0.47	6,754
Marital Status (1=Married)	0.60	1.00	0.49	1,519,538	0.47	0.00	0.50	7,493	0.48	0.00	0.5	6,754
Contribution/\$1,000	0.78	0.55	0.74	1,519,538	0.49	0.33	0.61	7,493	0.56	0.42	0.58	6,754
Faculty Dummy	0.19	0.00	0.39	1,488,996	0.14	0.00	0.35	7,374	0.16	0.00	0.36	6,636
College of Business Dummy	0.01	0.00	0.11	1,519,538	0.01	0.00	0.11	7,493	0.01	0.00	0.12	6,754
Panel C: Experimental/Survey Data												
Risk Preference Bet Dummy	0.57	1.00	0.49	48,502	0.60	1.00	0.49	202	0.54	1.00	0.50	176
Surveyed Knowledge Score	0.24	0.35	1.56	48,333	0.02	0.35	1.65	201	0.07	0.35	1.54	176
Surveyed Experience Score	0.24	0.21	0.20	48,333	0.20	0.14	0.18	201	0.22	0.14	0.20	176

\*Obs. for “All participant months” equals number of person-months. Others are for a single month, therefore, obs. equals persons.

## 4 Hypotheses

Our null hypothesis is that defaults have no effect. However, prior research documents strong default effects. Here, we focus on (1) the initial acceptance rate of each default, (2) the rate at which participants move away from the default they initially accepted, (3) the impact of the two defaults on overall equity exposures of participants and (4) the effect of demographic and other information we have about participants. As a result, all of our “hypotheses” below are formally alternative hypothesis guided by how the CLP framework suggests behavior will deviate from the null.

### 4.1 Control variables

We include several control variables that affect default rates and portfolio structure from prior literature.

**Age and age squared** Financial planners and academic research (e.g., Campbell and Viceira (2002)) both suggest that participants should reduce equity exposure as they age. Agnew, Balduzzi, and Sunden (2003) and Ameriks and Zeldes (2004), among others, show nonlinear effects. There is also some evidence that risk preferences are correlated with age (e.g., Hartog, Ferrer-i-Carbonell, and Jonker (2002)).

**Gender** Men and women may have different risk tolerances (e.g., Sunden and Surette (1998); Hartog, Ferrer-i-Carbonell, and Jonker (2002)). They may also have different levels of confidence which would affect the level of active choice (Barber and Odean (2001)).

**Marital status** Evidence on marital effects is mixed. Agnew, Balduzzi, and Sunden (2003) show that married participants take more risk in their retirement portfolios, possibly because marriage itself is a relatively safe asset (Bertocchi, Brunetti, and Torricelli (2011)) or marriage increases wealth (Schmidt and Sevak (2006)). Alternatively, Halek and Eisenhauer (2001) document that married people display more risk aversion. Finally, a couple may be making a joint financial decision and we only observe one participant.

### 4.2 Rates of accepting the default investment option

Choi et al. (2002) argue that participants accept the default option simply because it is the easiest thing to do. If that is the case, the default rates under the MMD and TDD options should not differ. This is consistent with the null hypothesis.

We ask whether deviations from the null appear consistent with the CLP framework (Camerer and Hogarth (1999)). Under this framework, participants will only make an active choice if the default choice differs sufficiently from their optimal choice.<sup>7</sup> This framework assumes each participant has some knowledge and goals when they join a retirement plan. The goals define the participant's objective function and their knowledge represents "cognitive capital" that they can apply to making an active choice. Both "declarative knowledge" (factual knowledge) and "procedural knowledge" (understanding how to apply knowledge to solve problems) help participants make optimal decisions. The degree to which a participant can come closer to achieving their goals through the choice is, in effect, a production function that transforms knowledge and effort into outcomes. Whether a participant makes an active choice depends upon: (1) how much capital (factual and procedural knowledge) they bring to the decision, (2) how much cognitive effort (labor) is required to make the decision and (3) how much the decision might benefit them (the production function). Benefits depend on how large a stake the participant has in the outcome and how sub-optimal the default is relative to the optimal portfolio. We anchor our alternative hypotheses in these factors.

We first consider the attractiveness and "stickiness" of the money market and target date defaults. Viewed through the lens of the CLP, there is no reason to expect participants to behave similarly with respect to the two defaults.

**Hypothesis 1** *Default acceptance rates will differ for the money market and target date defaults.*

**Hypothesis 2** *Participants who initially accept the default fund will exhibit different degrees of "stickiness" for the two defaults.*

The money market default is very low risk relative to the target date default. Possible explanations for the equity risk premium (Mehra and Prescott (1985)) are that investors are either extremely risk averse or view equity investments as extremely risky. Such participants may be unwilling to take risks with their lifetime retirement savings and, as a result optimally allocate very little to equity. According to the CLP framework, such participants are more likely to accept and stick with the money market default than the target date default.

Financial models imply that, participants who are not extremely risk averse should prefer portfolios with more risk (and higher expected returns) than the money market portfolio (e.g., Campbell and Viceira (2002)). For such participants, the money market fund is likely further from optimal than the target date fund. According to the CLP framework, such participants are more likely to accept and stick with the target date default than the money

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<sup>7</sup>See also Smith and Walker (1993).

market default.

Our next alternative hypothesis comes from the CLP framework implication that participants will only make the active choice if it is worth the effort to do so. Because they have more at stake, we expect participants with greater contributions will be less likely to accept the default. Further, in our data, the contribution/income ratio is fixed. Therefore contribution size proxies for income which is likely to be correlated with financial literacy and experience. Greater literacy (factual knowledge) and experience (procedural knowledge) reduce the required effort to customize the portfolio (Lusardi and Mitchell (2008)). Both of these observations lead to the following hypothesis:

**Hypothesis 3** *Participants with higher contributions will be less likely to accept and remain with defaults regardless of the default option.*

### 4.3 Asset allocation hypotheses

Target date funds are designed to offer high equity exposure to participants when they are young, with exposure declining slowly until retirement. There are some participants who, under the CLP framework, will accept any default. The amount they invest may be small or they may consider the job short-term, etc. Others will optimize.

Suppose each participant has an optimal equity allocation,  $e^*$ , and either optimizes by selecting a portfolio with an equity allocation equal to  $e^*$  or defaults into the default fund. The CLP framework implies that participants with low  $e^*$  likely default into the money market fund. Because the money market default has zero equity, having a money market default that some participants accept can only decrease the average equity allocation relative to what actively optimizing participants would choose on average. In contrast, the target date default will attract participants with an already high  $e^*$ . Depending upon the distribution of  $e^*$  relative to the target date default, this could raise or lower the percentage of equity in contributions. This observation leads to our next alternative hypothesis.

**Hypothesis 4** *TDD and MMD participants are likely to exhibit different average equity exposures.*

Participants who customize their portfolios can achieve any asset allocation they would like. However, we expect different types of participants to opt out of different defaults. These differences should affect their portfolio allocations.

By definition, participants who invest solely in the money market default have no equity in their allocations. Those who opt out could switch into other investments with no equity, but

switching will have the greatest value for participants who seek more risk in their contributions. Therefore, we hypothesize:

**Hypothesis 5** *MMD participants who opt out of the money market default allocate more to equity than participants who default into the money market fund.*

Target date funds are more likely to align with preferences of more risk tolerant participants (i.e., be closer to optimal for them). But those who opt out could desire either higher or lower equity contributions. This leads to:

**Hypothesis 6** *TDD participants who opt out of the target date default could on average allocate more or less to equity than participants who default into target date funds.*

In addition, we note that, if participants anchor and adjust their allocations as Tversky and Kahneman (1974) suggest, then even non-defaulting MMD participants may end up with lower equity than non-defaulting TDD participants. On the other hand, the non-defaulting MMD participants are likely more risk tolerant than those who accept the money market default. But, non-defaulting TDD participants are likely less risk tolerant than those who accept the target date default. This may lead to non-defaulting MMD participants allocating more to equity than non-defaulting TDD participants.

#### 4.4 Auxillary hypotheses

We can look at the effect of variables that may help explain individual differences in behavior. We know whether the participant is a faculty member and whether the participant is employed by the College of Business. These may be correlated with financial knowledge and experience, and should reduce the cognitive effort required to make an active choice. This would suggest that both variables imply a reduced likelihood of accepting default options. This leads to the following hypothesis:

**Hypothesis 7** *Faculty members and College of Business employees are less likely to accept the default option.*

For a subset of participants, we have responses from two surveys used in a related experiment. First, we have the score the participant received on a nine-question financial knowledge survey (declarative knowledge). Second, we have results from a four-question, self-reported survey on financial experience (procedural knowledge).<sup>8</sup> Again, this should reduce the cognitive effort required to make an active choice. Thus, both measures should correlate with lower tendencies to accept the default option. This leads to the following hypothesis:

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<sup>8</sup>See McDonald and Rietz (2017) for details.

**Hypothesis 8** *Participants with high knowledge and high levels of self-reported experience are less likely to accept the default option.*

We note that more informed, financially knowledgeable and more financially experienced participants are more likely to be aware of the common recommendation that participants should allocate relatively high proportions to equity, especially when they are young (e.g., Campbell and Viceira (2002)). This would indicate that these participants may invest more in equity. If being a faculty member and/or employed with the College of Business correlates with additional knowledge, experience or awareness, this effect would flow through to the faculty and College of Business dummy variables.

Finally, for the same subset of participants, we have results from whether the participant took a fair gamble in an experiment as a measure of risk preference.<sup>9</sup> If risk preferences across experimental gambles and investment portfolios are stable, our experimental measure of risk preference should also correlate with the tendency to accept the default and ultimate portfolio risk.<sup>10</sup>

**Hypothesis 9 Part a:** *MMD participants who take the experimental risk preference gamble are (1) less likely to accept the default option and (2) allocate more to equity than MMD participants who reject the gamble. Part b:* *TDD participants who take the experimental risk preference gamble are likely to allocate more to equity than TDD participants who reject the gamble.*

## 5 Results

### 5.1 Attractiveness and stickiness of the default options

In our data, we observe the first allocation of 7,493 participants who made their first contribution to the retirement plan between July 2002 and December 2010. In April, 2006, the University changed the default investment option from a money market fund to a target date fund. We have 2,988 unique participants who joined the plan under the money market default and 4,505 who joined under the target date default. Figure 1 separates participants by the default when they joined, shows the fraction of participants who accepted the default option under each, and plots the fraction remaining 100% in the default through 36 months after joining.

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<sup>9</sup>Again, see McDonald and Rietz (2017) for details.

<sup>10</sup>We note that there is considerable debate about the stability of risk preferences across contexts. See, for example, Berg, Dickhaut, and McCabe (2005).

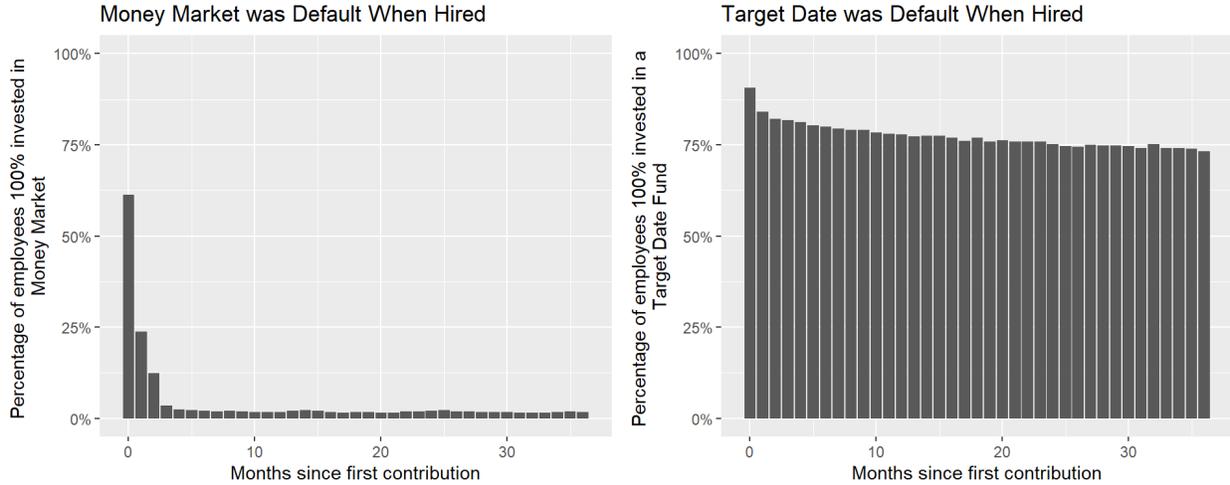


Figure 1: Percentage of participants who invest exclusively in the default option by month after joining and default when hired.

Figure 1 supports Hypothesis 1 and 2. With respect to Hypothesis 1, under the money market default, 61.4% of participants accept the default. This is similar to prior literature (e.g., Madrian and Shea (2001), Choi et al. (2002), Choi et al. (2003), and Choi et al. (2004)). Under the target date default, 90.7% of participants accept the default. This is higher than found in prior literature.

With respect to Hypothesis 2, the money market default is less sticky than the target date default. Only 2% of participants allocate exclusively to the money market fund six months after joining the plan. This contrasts sharply with Madrian and Shea (2001) (who show that over half of participants remain in the default option after a year and 40% remain after two years, p. 1174) and Choi et al. (2002) (who show almost half of participants are still “stuck” at the default after 3 years, p. 80). The target date fund proves quite sticky: nearly 2/3 of participants remain in the target date fund 3 years after joining.

However, each month in Figure 1 represents a slightly different set of employees. Every month, some employees leave the university and stop making contributions. To look for systematic differences in the behavior of employees who leave and those who remain, Figure 2 includes only defaulters who contribute continuously for 36 months after joining.

Table 2 presents logistic regressions for the probability of initially defaulting into the default fund (models 1a and 1b) and remaining in it six months later (models 2a and 2b). Models 1a and 1b are identical except for the definition of the Default Dummy. This makes it easy to compare behavior under the two defaults. In model 1a, the default dummy is 1 if the participant joined under the target date default. This means that the main coefficients

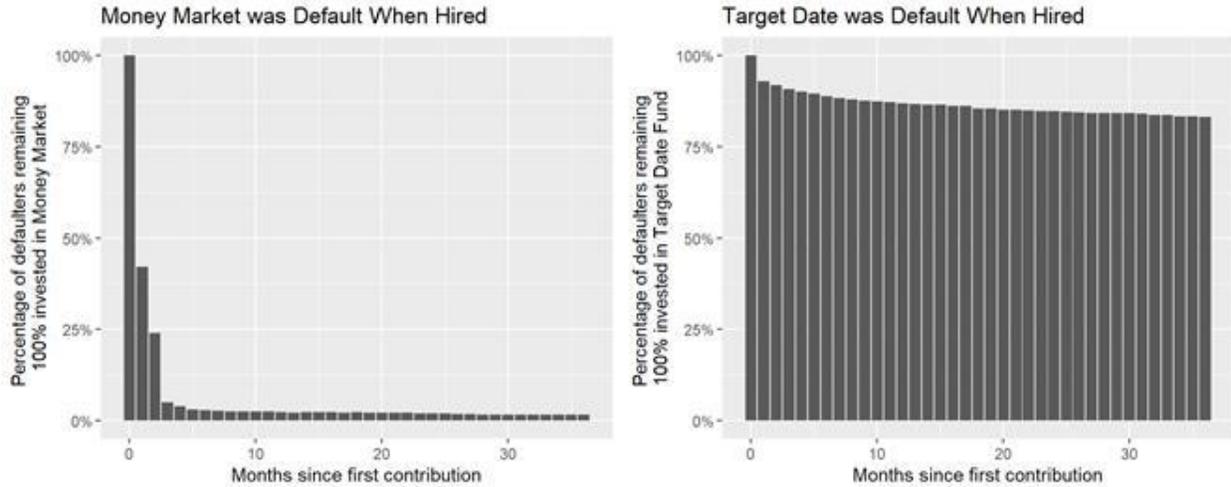


Figure 2: Percentage of initially defaulting participants who contribute each month for 36 months of employment and who continue to contribute exclusively to the default.

correspond to a MMD participant and the interactions indicate the marginal effect of shifting to a TDD participant. In model 1b, the default dummy is 1 if the participant joined under the money market default. This means that the main coefficients correspond to a TDD participant and the interactions indicate the marginal effect of shifting to a MMD participant. Thus, interactions show the impact of changing defaults and have the opposite sign between the two regressions, but contain exactly the same information. Models 2a and 2b are redundant regressions in the same way.

The logistic models are consistent with Figure 1 and support Hypotheses 1 and 2. The default dummy variables in Table 2 show that participants are somewhat more likely to default initially into the target date default than the money market default. However, participants are much more likely to stay in the target date default six months later.

Table 2 also supports Hypothesis 3. Significant coefficients on contribution in models 1a and 1b show that high contribution participants are significantly less likely than low contribution participants to accept either default option. The significant interaction term shows that high contribution participants are even less likely to accept the money market default than the target date default.

High contribution MMD participants are significantly more likely to customize their portfolios immediately and after six months than low contribution MMD participants. While the effect doesn't show up immediately for TDD participants, high contribution TDD participants are significantly more likely to customize their portfolios within six months.

Table 2: Logistic regressions to explain initial default behavior (models 1a and 1b) and remaining in the default six months later (models 2a and 2b). Models 1a and 2a use joining under the money market default as the base case, use a dummy for participants who joined under the target date default, and interact this dummy with other variables. Thus, the baseline coefficients corresponds to a MMD participant. Models 1b and 2b use joining under the target date default as the base case, use a dummy for participants who joined under the money market default, and interact this dummy with other variables. Thus, the baseline coefficients corresponds to a TDD participant. Standard errors in parentheses.

Model	1a	1b	2a	2b
Type	Logistic	Logistic	Logistic	Logistic
Dependent Variable	Initial Default	Initial Default	6- Mo. Default	6- Mo. Default
Baseline coefficients correspond to:	MMD	TDD	MMD	TDD
Default Dummy = 1 if Joined:	After TDD	Before TDD	After TDD	Before TDD
Constant	2.398*** (0.497)	3.850*** (0.647)	-6.190*** (1.945)	3.273*** (0.543)
Participant Age	-0.078*** (0.028)	-0.058 (0.036)	0.076 (0.103)	-0.074** (0.030)
Participant Age Squared	0.001** (0.0004)	0.0004 (0.0004)	-0.001 (0.0010)	0.001** (0.0004)
Gender (1=Female)	-0.1 (0.086)	0.08 (0.111)	0.038 (0.313)	0.129 (0.088)
Marital Status (1=Married)	-0.042 (0.083)	0.066 (0.118)	0.239 (0.311)	-0.125 (0.094)
Contribution/\$1,000	-0.571*** (0.110)	-0.291*** (0.064)	-0.083 (0.298)	-0.676*** (0.077)
Faculty Dummy (1=Faculty)	-0.212 (0.135)	0.008 (0.156)	0.249 (0.420)	0.352*** (0.134)
College of Business Dummy (1=In College of Business)	0.025 (0.368)	-0.371 (0.370)	0.28 (1.044)	-0.742*** (0.274)
Default Dummy	1.452* (0.816)	-1.452* (0.816)	9.463*** (2.019)	-9.463*** (2.019)
Default × Age	0.02 (0.045)	-0.02 (0.045)	-0.15 (0.107)	0.15 (0.107)
Default x Age Squared	-0.0004 (0.001)	0.0004 (0.001)	0.001 (0.001)	-0.001 (0.001)
Default × Gender	0.179 (0.140)	-0.179 (0.140)	0.092 (0.325)	-0.092 (0.325)
Default × Marital Status	0.108 (0.144)	-0.108 (0.144)	-0.364 (0.324)	0.364 (0.324)
Default × Contribution/\$1,000	0.281** (0.127)	-0.281** (0.127)	-0.592* (0.308)	0.592* (0.308)
Default × Faculty Dummy	0.221 (0.206)	-0.221 (0.206)	0.102 (0.440)	-0.102 (0.440)
Default × College of Business Dummy	-0.396 (0.522)	0.396 (0.522)	-1.022 (1.079)	1.022 (1.079)
Observations	7,374	7,374	6,636	6,636
Log Likelihood	-3,252.25	-3,252.25	-2,059.81	-2,059.81
Akaike Inf. Crit.	6,536.51	6,536.51	4,151.63	4,151.63

\* = 90% level of confidence, \*\* = 95% level of confidence, \*\*\* = 99% level of confidence

## 5.2 Equity Exposure

To test Hypothesis 4, we look at equity exposures in allocations of MMD participants versus TDD participants. Figure 3 shows average equity exposures for participants who joined under each default for the 36 months after they joined the plan.



Figure 3: Average equity exposures over the 36 months after joining for MMD participants (left) and TDD (right) participants.

Table 3 shows OLS regressions explaining equity exposures for participants. The regressions are structured similarly to those in Table 2. As before, we present regressions differing only in the definition of the default dummy variable and interactions. In model 3a, the default dummy is 1 if the participant joined under the target date default. In model 3b, the default dummy is 1 if the participant joined under the money market default. Interactions show the impact of changing defaults and have the opposite sign between the two regressions, but contain exactly the same information.

Both Figure 3 and Table 3 support Hypothesis 4. In particular, the coefficient on the default dummy variables in regressions 3a and 3b are significant and economically meaningful. The coefficient shows that TDD participants allocated 53 percentage points more to equity than MMD participants after controlling for other factors.

To test Hypotheses 5 and 6, we look at equity exposures for participants who initially defaulted and remain in the default, initially defaulted but now have a customized allocation, and never defaulted.

Figure 4 shows average equity exposures for MMD participants who (1) initially defaulted and remain in the default, (2) initially defaulted but now customize their allocation and (3)

Table 3: OLS regressions to explain the equity exposure of participants overall. Model 3a uses joining under the money market default as the base case, uses a dummy for participants who joined under the target date default, and interacts this dummy with the other variables. Thus, the baseline coefficients corresponds to a MMD participant. Model 3b uses joining under the target date default as the base case, uses a dummy for participants who joined under the money market default, and interacts this dummy with other variables. Thus, the baseline coefficients corresponds to a TDD participant. Robust standard errors clustered by participant in parentheses.

Model Type	3a OLS Equity Allocation MMD After TDD	3b OLS Equity Allocation TDD Before TDD
Dependent Variable		
Baseline coefficients correspond to:		
Default Dummy = 1 if Joined:		
Constant	0.393*** (0.031)	0.921*** (0.041)
Participant Age	0.015*** (0.001)	0.001 (0.002)
Participant Age Squared	-0.0002*** (0.000)	-0.0002*** (0.000)
Gender (1=Female)	-0.008* (0.005)	-0.009 (0.006)
Marital Status (1=Married)	0.009* (0.005)	0.004 (0.007)
Contribution/\$1,000	0.019*** (0.003)	0.003 (0.005)
Faculty Dummy (1=Faculty)	0.003 (0.006)	-0.008 (0.009)
College of Business Dummy (1=In College of Business)	0.092*** (0.016)	0.007 (0.017)
Default Dummy	0.528*** (0.051)	-0.528*** (0.051)
Default × Age	-0.014*** (0.003)	0.014*** (0.003)
Default x Age Squared	0.0001* (0.000)	-0.0001* (0.000)
Default × Gender	-0.001 (0.008)	0.001 (0.008)
Default × Marital Status	-0.005 (0.009)	0.005 (0.009)
Default × Contribution/\$1,000	-0.016*** (0.006)	0.016*** (0.006)
Default × Faculty Dummy	-0.011 (0.011)	0.011 (0.011)
Default × College of Business Dummy	-0.085*** (0.023)	0.085*** (0.023)
Observations	1,488,996	1,488,996
R2	0.053	0.053
Adjusted R2	0.053	0.053

\* = 90% level of confidence, \*\* = 95% level of confidence, \*\*\* = 99% level of confidence

never defaulted. Obviously, MMD participants who customize their portfolios allocate far more to equity than those who don't.

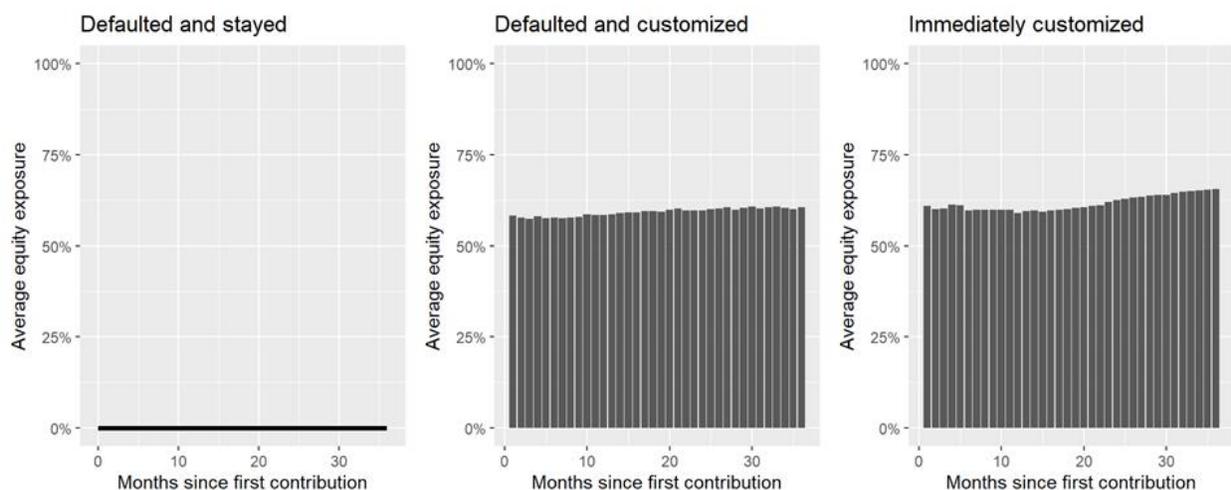


Figure 4: Average equity exposures over the 36 months after joining for MMD participants who initially defaulted and remain in the default (left), initially defaulted but now customize their allocation (middle) and never defaulted (right).

Table 4 shows regression results on equity exposure by the default when participants joined. Two dummy variables indicate whether participants initially defaulted and whether they remain in the default option. Model 4a shows results for MMD participants while Model 4b shows results for TDD participants.

Model 4a in Table 4 supports Hypothesis 5. The Initial Defaulter coefficient shows that MMD participants who initially default allocate less to equity than those who immediately customize their allocations. Because we include all observations for a participant in this regression, this is more than just the effect of the initial contribution. The current defaulter coefficient shows that MMD participants who are allocating exclusively to the default money market fund allocate significantly less to equity than participants who customize their portfolios. Thus, participants who customize are not simply moving to another low risk asset class. They are moving into equity as hypothesized.

Figure 5 shows average equity exposures for TDD participants who (1) initially defaulted and remain in the default, (2) initially defaulted but now customize their allocation and (3) never defaulted. Notice that the target date defaulters allocate less to equity through time. This is because of the target date glide paths. On average, TDD participants customize to portfolios that allocate somewhat less to equity than the target date default.

Model 4b in Table 4 supports Hypothesis 6. The Initial Defaulter coefficient shows that

Table 4: OLS regressions to explain the equity exposure of participants by whether they initially defaulted and whether they remain in the default. Model 4a shows results for MMD participants. Model 4b shows results for TDD participants. Robust standard errors clustered by participant in parentheses.

Model Participants Dependent Variables	4a MMD Equity Exposure	4b TDD Equity Exposure
Constant	0.364*** (0.066)	0.791*** (0.037)
Initial Defaulter	-0.018* (0.010)	0.078*** (0.027)
Currently Defaulting	-0.430*** (0.023)	0.041*** (0.011)
Participant Age	0.015*** (0.003)	0.002 (0.002)
Participant Age Squared	-0.0002*** (0.00004)	-0.0002*** (0.00003)
Gender (1=Female)	-0.026** (0.011)	-0.010* (0.006)
Marital Status (1=Married)	0.011 (0.010)	0.004 (0.007)
Contribution/\$1,000	0.035*** (0.008)	0.013** (0.005)
Faculty Dummy (1=Faculty)	-0.030** (0.014)	-0.01 (0.009)
College of Business Dummy (1=In College of Business)	0.087** (0.036)	0.015 (0.017)
Observations	185,108	133,065
R2	0.115	0.357
Adjusted R2	0.115	0.357

\* = 90% level of confidence, \*\* = 95% level of confidence,  
\*\*\* = 99% level of confidence

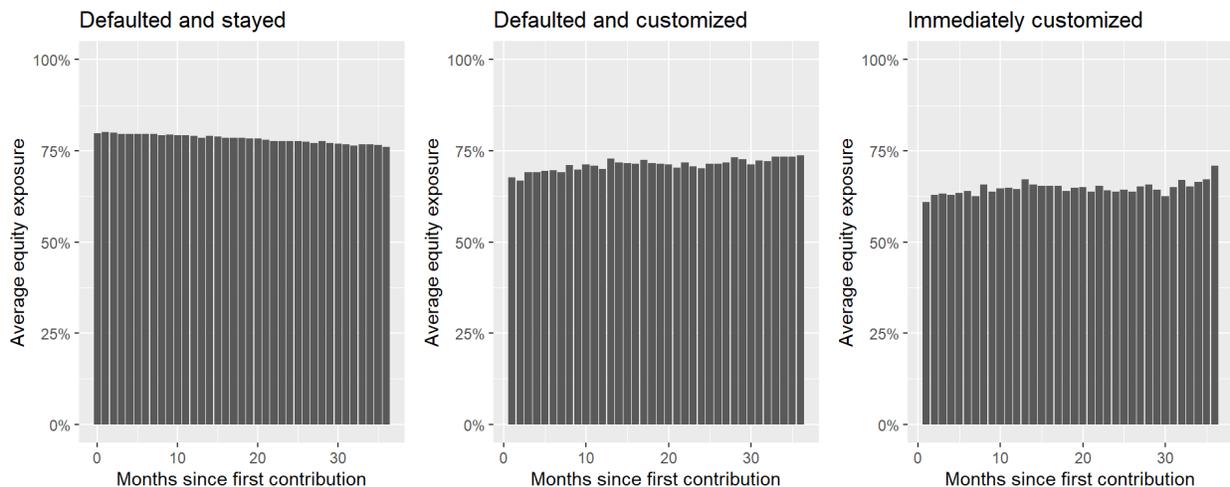


Figure 5: Average equity exposures over the 36 months after joining for TDD participants who initially defaulted and remain in the default (left), initially defaulted but now customize their allocation (middle) and never defaulted (right).

TDD participants who initially default allocate more to equity than those who immediately customize their allocations. Because we include all observations for a participant in this regression, this is more than just the effect of the initial contribution. The current defaulter coefficient shows that TDD participants who are allocating exclusively to the default money market fund allocate significantly more to equity than participants who customize their portfolios. Thus, participants who customize are moving out of equity as hypothesized.

### 5.3 Additional Results

Tables 2 and 3 provide evidence on Hypothesis 7. While there is little difference in initial default behavior, faculty members are significantly more likely to remain in the target date default after six months. In contrast, College of Business employees are less likely to remain in the target date default after six months. We note that there is no significant difference in equity allocations between faculty and non-faculty participants. However, if they joined under the money market default, College of Business employees allocate more to equity on average than non-College of Business employees.

Incorporating the experimental survey variables into the regressions creates issues. First, the number of observations drops considerably and fully interacted models are likely to be over fitted. Second, the two survey measures are highly correlated ( $\rho = 0.3883$ , p-value = 0.0000), which may dilute the significance of either or both variables. Instead, we run additional regressions to see whether each experimental variable correlates with (1) overall

default behaviors and equity allocations and (2) with the residuals from the regressions in Tables 2 and 3. The first regressions tell us whether the experimental variables are associated with behavior overall. The second regressions tell us whether they add explanatory power to the existing control and dummy variables.

Table 5 presents the results for all participants (All), MMD participants (MMD) and TDD participants (TDD).

Table 5: Regression coefficients and significance levels for regression of participants' behavior and residual behavior from Tables 2 and 3 on experimental variables

Panel A: Financial Knowledge Score						
Independent Variable	Initial Default Dummy			Residuals from Model 1a		
	All	MMD	TDD	All	MMD	TDD
Initial Default	-0.104 (0.095)	0.005 (0.124)	-0.533*** (0.192)	-0.022 (0.018)	0.015 (0.030)	-0.061*** (0.022)
Default at 6-months	-0.157 (0.100)	0.671 (0.926)	-0.551*** (0.185)	-0.034** (0.016)	0.006 (0.008)	-0.078*** (0.029)
Equity Allocation	0.009 (0.008)	0.013 (0.008)	-0.027 (0.027)	0.008 (0.007)	0.012 (0.007)	-0.026 (0.026)
Panel B: Self-reported Financial Experience Score						
Independent Variable	6 Month Default Dummy			Residuals from Model 2a		
	All	MMD	TDD	All	MMD	TDD
Initial Default	-2.369*** (0.839)	-0.718 (1.230)	-4.682*** (1.341)	-0.424*** (0.162)	-0.035 (0.295)	-0.697*** (0.182)
Default at 6-months	-1.353* (0.813)	1.502 (4.160)	-3.179*** (1.168)	-0.292** (0.127)	0.016 (0.067)	-0.537** (0.214)
Equity Allocation	0.173*** (0.053)	0.183*** (0.058)	0.098 (0.091)	0.149*** (0.053)	0.156*** (0.058)	0.082 (0.085)
Panel C: Risk Preference Bet						
Independent Variable	Equity Exposure			Residuals from Model 3a		
	All	MMD	TDD	All	MMD	TDD
Initial Default	0.196 (0.309)	0.448 (0.473)	0.046 (0.478)	0.033 (0.061)	0.088 (0.114)	0.0003 (0.069)
Default at 6-months	-0.282 (0.306)	-18.132 (4622.054)	-0.322 (0.442)	-0.075 (0.050)	-0.032 (0.028)	-0.106 (0.083)
Equity Allocation	-0.022 (0.024)	-0.007 (0.023)	-0.135 (0.097)	-0.019 (0.023)	-0.008 (0.022)	-0.114 (0.098)

\* = 90% level of confidence, \*\* = 95% level of confidence, \*\*\* = 99% level of confidence

Table 5, Panel A shows the relationship between the financial knowledge score, default behavior and equity allocations. The first three columns are single variable regressions that do not control for other factors. The second three are single variable regressions on the residuals from the regressions in Tables 2 and 3. This controls for the other explanatory variables and asks whether measured financial knowledge explains any of the remaining

variance. Participants with higher financial knowledge are less likely to default initially into the target date fund and remain in it six months later. This gives support for Hypothesis 8. However, it is not universal. Because nearly all participants opt out of the money market default, there is no significant difference due to measured financial knowledge. Further, there is no significant effect on equity exposure.

Table 5, Panel B shows the relationship between self-reported financial experience, default behavior and equity allocations. Participants with higher financial experience are less likely to default initially overall and default initially into the target date fund. They are less likely to remain in the default overall and in the target date default six months later. They allocate more to equity on average overall and under the money market default. This gives support for Hypothesis 8. Again, it is not universal. Because nearly all participants opt out of the money market default, there is not a significant difference six months later due to self-reported financial experience. For TDD participants, there is no significant effect on equity allocation.

Results for the risk preference bet are in Table 5, Panel C. These do not align with Hypothesis 9. There are no significant relationships with default behavior nor equity allocations. This may be due to instability of risk preferences across contexts (Berg, Dickhaut, and McCabe (2005)). It may be that participants should be risk neutral for small gambles and, therefore, it is hard to project risk preferences in large portfolios from small gamble behavior (e.g., Rabin (1997)). This is an area for additional exploration.

## 6 Conclusion

Prior research on retirement plan defaults has found significant effects on participant behavior. None of these studies, however, examined how different default investment funds might affect participant choices. In this paper, we use a natural experiment to document how participant behavior changed when there was a change in the default investment in the University of Iowa defined contribution pension plan. Under the money-market-fund default, before 2006, most participants moved out of the default fund, customizing their portfolios to add equity. After the change to the target-date-default, most participants had not left the default after three years. Average equity allocations were greater for participants who joined under a target date default than for those who joined under a money market default overall and even when considering only those who customized their portfolio.

A framework consistent with this behavior is the Camerer and Hogarth (1999) capital-labor-production (CLP) framework. This implies that participants will make the “passive choice” when the default option is reasonably close to their optimal choice or making an active

choice requires too much effort. They will make an active choice to customize their portfolio when the default differs significantly from their optimal choice, when there is more at stake, and when the effort to determine a better choice is sufficiently low. Overall, our results are consistent with this in combination of two ideas: (1) generally, “lifecycle funds are vastly superior to money market funds” (Basu, Chen, and Clements (2014, 51)) and (2) participants are more likely to opt out of defaults that they view as suboptimal (Choi et al. (2003)).

An open question, which we plan to address in ongoing research, is the broader validity of these results. Since our findings with respect to the default portfolio differ from those in Madrian and Shea (2001), it is important to understand why. An additional goal is to develop a more granular understanding of characteristics that lead a participant to accept or reject different defaults.

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