Saving for retirement, Annuities and Procrastination

by

Jeffrey R. Brown
University of Illinois at Urbana-Champaign and NBER

and

Alessandro Previtero
Indiana University and NBER

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Abstract: We provide new and robust empirical evidence that procrastinators exhibit different financial behaviors than non-procrastinators. We define a procrastinator as one who waits until the last day of their health care open enrollment period to make a plan election. We show that procrastinators take longer to sign up for 401(k) plans, contribute less, are more likely to stick with default portfolio allocations, and are more likely to choose a lump sum over an annuity as a payout option, especially when the lump sum is more salient. Further evidence indicates that our findings are best explained by procrastination being the outcome of present-biased preferences.

Keywords: *Procrastination, present-biased preferences, hyperbolic discounting, retirement saving, annuities, framing*

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"You cannot escape the responsibility of tomorrow by evading it today."

- Abraham Lincoln

1. Overview

The popular press is full of articles pointing fingers at procrastination as an enemy of good financial planning. The idea is certainly intuitive: planning for retirement involves near-term actions with distant consequences, and it is easy to put it off when faced with more immediate temptations or demands on one's time. Indeed, the trade-off between near-term costs and distance consequences is the reason that economists treat procrastination as stemming from present-biased preferences (e.g., Akerlof 1991; O'Donoghue and Rabin 1999a). Surprisingly, however, there is very little empirical research to confirm or refute the idea that procrastination has a meaningful effect on financial security in retirement, and virtually no empirical work showing that procrastination arises from present-biased preferences. This paper seeks to fill that void.[1] First, we provide robust evidence that procrastinators behave differently than non-procrastinators when it comes to several major actions related to financial preparation for retirement. Then, we discuss why the entirely of our empirical results are best explained by models of present-biased preferences.

We construct a novel empirical measure of procrastination based on actual decision-making delays, an approach that can be easily implemented using administrative data on benefit choices. Specifically, we measure procrastination by whether an individual waits until the last day of an open enrollment window to make their health care plan election. We label those who wait until the last day as "procrastinators," whereas those who make their health care plan election in advance of the deadline are labeled as "non-procrastinators."

[1] Similar in spirit to our paper, Meier and Sprenger (2010) and Kuchler (2015) investigate the effects of present-biased preferences on credit card borrowing or paydown.

We then examine how procrastinators differ from non-procrastinators when it comes to several financial behaviors that are important for retirement planning. Relative to non-procrastinators, we find that procrastinators: take longer to join a 401(k) plan, contribute less, are more likely to stick with portfolio default options, and are less likely to choose an annuity in defined benefit (DB) plans, especially when the lump-sum is made more salient. These results are confirmed in a wide range of specifications, samples and robustness checks.

There are numerous advantages of using observed delays in making health care plan elections as an empirical measure of procrastination rather than using self-reported survey measures or low-stakes lab experiments that are common in the psychology literature. A key advantage is that the consequences are real rather than hypothetical. In particular, both health care plan elections and retirement plan choices are financially consequential, which increases confidence in the external validity of the findings. Another nice feature is that the health care plan election and retirement plan choices are similar enough for the health care plan election behavior to be informative, but not so similar as to introduce any mechanical correlations with our retirement-related outcomes of interest. For example, if we instead used delay in signing up for the retirement plan itself as our measure of procrastination, one could certainly not measure the causal effect of procrastination on the propensity to sign up for the same plan. Another benefit of using administrative data is that it should be easy to replicate in any administrative data for which the researcher has access to decision timing. Indeed, we use multiple data sources in this study, which itself increases the degree of confidence that this approach is robust. Finally, reliance on administrative data substantially reduces concerns about measurement error that often arise when using survey data.

With these advantages comes a potential concern that is common to many studies using administrative data: namely, that we have a limited set of demographic controls. We take comfort in showing that the effect of procrastination exists after controlling for gender, age, plan effects, year effects and, where possible, for income. Ultimately, however, we rely on the identification assumption that the correlations between observed procrastination in making health care plan elections and the financial behaviors that we study are not driven by additional unobservable factors.

Having established a robust correlation between procrastination and important financial behaviors, we then turn to the task of showing that our measure of delay is indeed a measure of procrastination that derives from present-biased preferences. We do this by ruling out alternative stories, including optimal delay, rational inattention, being busy or disorganized, and liquidity constraints. For example, we use data on prior submissions made within the enrollment period to separate optimal delayers from procrastinators, and show that our results are indeed driven by procrastinators. We also do a stylized calculation to show that these are consequential decisions, which casts significant doubt that rational inattention could explain our results. We also discuss that a subset of our results – namely those related to contribution rates conditional on saving, and those related to annuitization – are consistent with present-biased preferences and not alternative stories. Furthermore, our results are also robust to controlling for income or, where possible, zip code level proxies for financial literacy and liquidity constraints. In the end, the most likely hypothesis that can explain the entirety of our results is that individuals with present-biased preferences are more likely to procrastinate, and this combination of preferences and behavior lead them to behave quite differently from non-procrastinators when it comes to preparing for retirement.

This paper proceeds as follows: In section 2, we provide a very brief overview of the existing literature on procrastination, drawing upon both psychology and economics. In section 3, we describe the two main administrative data sets that we use in our empirical work. We explain our methodology in section 4 and present our key results in section 5. In section 6, we discuss why our results are most consistent with present-biased preferences, rather than other hypotheses, as the underlying reason for procrastination. In section 7, we introduce additional robustness tests. Section 8 provides a summary and conclusions.

2. A Brief Review of the Literature on Procrastination

Procrastination is a feature of human behavior with a very long pedigree. As far back as 800 BC, the Greek poet Hesiod stated:

> *"Do not put your work off till tomorrow and the day after; for a sluggish worker does not fill his barn, nor one who puts off his work …"*[2]

It is not surprising, then, that procrastination has received significant attention in the psychology literature. Harriott and Ferrari (1996) provide evidence that procrastination is widespread, with chronic procrastination affecting as many as one in five adults. As an aside, professors reading this paper may not be surprised that procrastination is more prevalent among college students!

Because researchers have documented the stability of procrastination tendencies across time and situations, some psychologists consider procrastination to be a personality trait that is at least in part biological or genetic in nature (Arvey, et al 2003), although not all agree with labeling it a personality trait. Steel (2007) concludes that procrastination is one aspect of conscientiousness,

[2] This quote, along with much of the discussion of the psychology literature, is summarized from an excellent survey article by Steel (2007). A less technical summary of this same material can be found at: http://www.slate.com/articles/life/procrastination/2008/05/procrastination_2.html

which is itself considered to be one of the "Big Five" personality traits in the psychology literature.

Among economists, Akerlof's 1991 Richard T. Ely Lecture is often viewed as ground zero for the formal treatment of procrastination. He models individuals as overweighting near-term costs and heavily discounting future costs. He speculates that procrastination could help explain the difficulties that many individuals have in saving adequately for retirement, although he does not test this proposition. Building on Akerlof's insights, O'Donoghue and Rabin (1999a) coined the term "present biased preferences" to refer to the broad class of models – including Laibson's (1997) influential model of hyperbolic discounting – in which individuals have time-inconsistent preferences that lead them to place a disproportionately greater weight on near-term well-being than more distant well-being. In their model, a person with present-biased preferences (and who is not sophisticated enough to recognize this proclivity and engage in self-control to overcome it) will tend to procrastinate in the face of near-term costs of action.

In household finance, researchers have suggested procrastination as one of several possible explanations for why default options (such as auto-enrollment into 401(k) plans) have such a powerful effect on behavior (Beshears et al 2009). Although both intuitive and consistent with many observed behaviors, we have little empirical evidence that provides a direct causal link between procrastination and these financial behaviors. Our study intends to fill this gap.

3. Data Overview

The primary results of this paper are based upon two administrative data sets provided by a large retirement plan record-keeper. A key feature of the data is that we are able to link

retirement plan selections with information on whether each individual delayed the timing of their health care plan election.

The first dataset is a sample of 154,870 employees participating in 27 defined contribution (DC) plans from 23 distinct firms. We observe one cross-section of data as of the beginning of 2009 with the number of days it takes an individual to enroll in their DC plan, their DC plan contribution rates, and their portfolio allocations. Our sample consists of every employee who joined one of the firms between 2002 and 2008 and is still employed by the firm as of the end of 2008. Table 1 Panel A shows that the average age of those joining the firms is just around 35 years, with a slight majority male. As can be seen, these are very large plans and large firms, with nearly 23,000 participants per plan on average and over 50,000 employees per firm. Depending on our definition of procrastination, which we will discuss in more detail below, procrastinators comprise between 3.4% and 12.5% of the sample.

A second data set, provided by the same retirement plan record-keeper, allows us to observe the annuity versus lump-sum decisions of 27,231 individuals retiring between 2002 and 2008 from 63 defined benefit (DB) plans, offered by 37 different firms. Table 1 Panel B shows summary statistics for this DB sample. Keeping in mind that these are individuals making a payout choice upon separation from the firm, it is not surprising that the population is older with a mean and median age of 60. We will discuss our measures of procrastination in the next section.

In our robustness section (section 7.2 below), we will introduce a third data set from the University of Illinois that allows us to examine the decision of whether to participate in a purely voluntary supplemental retirement plan. This analysis will also serve as an "out-of-sample" test of our procrastination measure.

4. Empirical Strategy

4.1 Defining procrastination

Our measure of procrastination is based on the delay in making elections during the health care open enrollment period. From a theoretical standpoint, O'Donoghue and Rabin (1999a) and, specifically in the context of saving for retirement, O'Donoghue and Rabin (1999b) have studied the tendency of *naïve* (i.e., unaware of their self-control problems) present-biased individuals to procrastinate costly tasks. Our working hypothesis is that the behavior of naïve individuals is consistent across different – but still somewhat similar – domains and that procrastination in their health care elections could be a good predictor of their present-bias in financial behaviors related to retirement planning.[3]

In our administrative data, we have detailed information about each employee's health care plan election in the period between 2002 and 2008. Specifically, we know the dates of the open enrollment window in the year of hire and in subsequent years. We also know whether the individual logged into the online system or phoned in at any time during the process, even if they did not submit a plan election at the time of that interaction. Importantly, we also know the date that the individual made their final health care plan election for the year. If an employee never makes a health care plan election, we do not know if this is because they are covered by a spouse's insurance, defaulted into a plan, or for some other reason. Because we cannot define these employees as procrastinators or non-procrastinators, we drop them from our analyses.

As noted above, we restrict our DC data to individuals that have joined the firm during the 2002 through 2008 period so that we can observe their initial plan election choice in the year of

[3] In unreported regressions, we find at most a weak link between demographic variables (e.g., age and gender) and the tendency to procrastinate in health care elections. Only being a procrastinator in the past election has a statistical and economically significant effect and increases the probability of being a procrastinator by 12.2 percentage points. This evidence supports our intuition that our measure is indeed capturing a more stable personality trait or tendency.

hire. We define them as a procrastinator if the individual waits until the very last day of their open enrollment period to make their first health care plan election *and* if they had no prior interaction with the online system during that period.

Procrastinator First = 1 if the individual waited until the last day to make their very first plan election (i.e., when they were hired), and = 0 otherwise.

In our robustness section below, we will separately examine those individuals who interacted with the plan election system earlier than the last day but who waited until the last day to make their final election.

Because we observe individuals in multiple years, we can also create additional measures of procrastination that are more or less restrictive than *Procrastinator First* based upon whether they exhibit procrastination tendencies over multiple years. Two additional measures on which we focus in our main results are:

Procrastinator Ever = 1 if in any year from the point of hiring through the end of our data, the individual had at least one year in which they waited until the last day to do their health care plan election, and = 0 otherwise.

Procrastinator Always = 1 if they waited until the last day in every year in which they made a selection, and = 0 otherwise.

Naturally, the *Procrastinator Ever* measure will be more inclusive (i.e., will label more employees as procrastinators), whereas the *Procrastinator Always* measure will be less inclusive (i.e., will label fewer employees as procrastinators). For example, and as see in Table 1, in our DC sample, the fraction of the sample defined as a procrastinator varies from 12.5% for *Procrastinator Ever* to 7.3% for *Procrastinator First* to 3.4% for *Procrastinator Always*. In our DB sample, the fractions are 8.4%, 4.2% and 1.4% respectively.

We have also constructed two other measures of procrastination that, in the interest of space, we do not include in our main tables. These are *Procrastinator Last* = 1 if the individual procrastinated the last time they made a plan election and =0 otherwise, and *Procrastinator Mean* = the fraction of all health care plan elections made by the individual for which he waited until the last day. In unreported analyses, we find very similar results with these two additional measures.

4.2 Basic Specification

Our baseline specification is as follows:

$$\text{Financial Behavior}_{ip} =$$

$$\beta_0 + \beta_1 \text{Procrastinator}_{ip} + \beta_2 \text{Female}_{ip} + \beta_3 \text{Age}_{ip} + \beta_4 \#\text{Elections}_{ip} +$$

$$+\beta_5 \log(\text{Firm Size})_p + u_p + \gamma_t + \varepsilon_{ip} \quad \textbf{(1)}$$

where *i* signifies the individual and p the plan. *Procrastinator* signifies one of the various procrastination measures identified above. β_3 measures the effect of age in 5-year increments (starting at age 18). β_4 is the coefficient on the number of health care plan elections made by the individual in our sample period. We include log of firm size (β_5) and a set of plan indicator variables (u_p) to control for plan and firm effects. We also include a set of indicator variables for the calendar year that the individual joined the plan (γ_t).

For ease of interpretation, we report OLS coefficients for most specifications, although we also use a Cox Proportional Hazard model to examine the number of days it takes to sign up for a DC plan. We have confirmed that our results hold in non-linear models (Tobit and/or Probit) in addition to OLS. Standard errors are clustered at the plan level.

Our baseline specification is parsimonious for two reasons. First, as already noted, our administrative data does not include many demographic variables. Second, we want to restrict our baseline control variables to those that are not themselves partly determined by procrastination. Both the psychology and economics literatures have found that procrastination can affect a wide range of behaviors. For example, Tanaka, Camerer and Nguyen (2010) show that procrastination negatively predicts income. Thus, procrastination may have both direct and indirect (operating through other covariates) effects on outcomes. In the robustness section 7.1, we use a mediation analysis to explore whether procrastination has both a direct effect on our observed outcomes as well as an indirect effect through income. In the Internet Appendix, we include additional controls such as zip-code level measures of financial literacy and liquidity constraints. The inclusion of these variables does not alter our finding of a robust correlation between procrastination and financial behaviors.

5. Results

In the analysis that follows, we examine several key behaviors related to financial planning for retirement. We will look at these decisions roughly in the order that an individual experiences these decisions over their lifecycle. We will begin with our DC sample by examining how long it takes an individual to sign up for a 401(k) plan. Second, we will examine how much a participant chooses to contribute as a percent of pay. Third, we will examine how individuals allocate their portfolio: specifically, their propensity to stick with default portfolio allocations. Finally, we will turn to our DB sample of individuals retiring during our sample period to examine whether the select and annuity or a lump-sum from their DB plan.

5.1 Time to Enroll in a 401(k)

Turning now to the data on 55 DC plan sponsors, the first three columns of Table 2 show the results of an OLS regression of the number of days it took the employee from their hire date to sign up for the firm's DC plan, conditional on eventually signing up within 5 years of one's start date. Each column corresponds to a different measure of procrastination. The coefficients on procrastination are statistically significant at the 1% level in all three specifications. Procrastinators take 50 to 63 days longer to sign up for a 401(k) plan than non-procrastinators. For perspective, if an employee changes jobs 5-6 times over her career, then a two month sign-up delay each period would correspond to an entire year of lost employer and employee contributions.

In columns (4) through (5) of Table 2, we repeat the analysis using a Cox proportional hazard model in which the dependent variable is the conditional probability of signing up for the plan on a given day, conditional on having not yet signed up. In the Cox specification, a coefficient is multiplicative of the baseline hazard rate: thus, a coefficient less than 1 means that the individual is less likely to join the plan on that date. The coefficient ranges from 0.82 to 0.84, which corresponds to a 16-18% reduction in the hazard rate.

5.2 Contribution Rates

In Table 3 we analyze the effect of procrastination on DC plan contributions as a percent of salary. Because we are only able to calculate individual contribution rates in the 2008 data, we restrict our sample to individuals joining the plan in this year, thus reducing our sample size from over 150,000 observations to just over 27,000 observations. In columns (1) through (3), we examine the effect of procrastination on contribution levels for the full 2008 sample. We find

that procrastinators contribute 47 to 61 basis points per year less than non-procrastinators. This corresponds to a 6.5 - 8.5% reduction in contributions relative to the baseline rate of 7.2%.

Prior research has shown that firms that use automatic enrollment often have the effect of guiding many participants to contribute at the default rate. If procrastinators are more likely to be auto-enrolled at a default saving rate, as hypothesized by Madrian and Shea (2001) and Beshears et al (2009, then this would make it harder to find an effect of procrastination on saving rates. To address this, we create an empirical proxy for which firms have auto-enrollment.[4] In columns (4) through (6), we limit the sample to plans we have identified as *not* having auto-enrollment, whereas columns (7) through (9) report results for plans that we identified as having auto-enrollment.

Consistent with our hypothesis, we find that the negative effect of procrastination on contribution levels is concentrated in firms without default options. The coefficients are even larger than in the full sample, ranging from a 56 to a 76 basis point reduction in contribution rates, or a 7.8 – 10.6% reduction in baseline saving rates. In contrast, the contribution rates of procrastinators in plans we have identified as having auto-enrollment features are statistically indistinguishable from non-procrastinators.

The results in Table 3 are restricted to new employees in 2008 for reasons noted above. However, we can look at the 2008 contribution rate for all individuals, including those who

[4] We classify a plan as using automatic enrollment if at least 30% of its employees: i) enroll on the same date (measured as days after employment date); ii) have all their savings invested in "Qualified Default Investment Alternatives" (QDIAs) (i.e., lifecycle funds after 2008) as defined by the Pension Protection Act. Although our empirical results are robust to use different cut-offs (20 and 10%), a nice feature of the 30% rule is that we generate aggregate plan-year patterns of default adoption that are reasonable in comparison to external data – provided by PLANSPONSOR[4] - on the frequency of default adoption by large plans. In 2003, for example, we estimate that 4 out of 26 firms (about 15%) in our data have automatic enrollment, whereas the PLANSPONSOR data indicates that 20% of plans with over $1 billion of assets had automatic enrollment. By 2008, 10 of our 24 plans (about 42%) are labeled as auto-enrolling firms, whereas the PLANSPONSOR data reports that about 48% of large firms were auto-enrolling in that same year.

joined in earlier years. To the extent that procrastinators eventually get their savings levels up over time, one might expect the effect of procrastination on contribution rates to diminish over time. In Appendix Table A.1, we repeat the analysis of Table 4 on the full sample, and find exactly this pattern. Specifically, we continue to find that procrastinators save less than non-procrastinators and that this effect is concentrated among firms that do not have auto-enrollment. However, the effect is substantially mitigated, with effects of 10-20 basis points.

These saving results suggest that procrastinators contribute less than non-procrastinators, and are more likely to contribute at the default rate when the firm has automatic enrollment. On a more positive note for procrastinators, we find that these reduced saving rates are not permanent, as the negative effects diminish the longer the person is in the plan.

In Table 4 we run quantile regressions to test if the effect of procrastination is constant across the saving rate distribution. Individuals with stringent liquidity needs might be busy handling the day-to-day demands on their limited resources and might indeed be more likely to procrastinate on both their health care elections and their retirement planning decisions. While we address the role of liquidity constraints more formally in section 6.4, here we want to test if our saving rates results are largely concentrated in the bottom of the saving rate distribution where employees with liquidity constraints are likely to be disproportionately more represented.

In table 4 we document that the effect of procrastination become larger as we move across the saving rate distribution from the bottom 25th percentile (with rates of 5% of annual income) to the 75th percentile (with rates of 9%) or the 90th percentile (where rates are 13%). Depending on the measure of procrastination, we estimate procrastination effects at the 25th percentile between 22 to a 34 basis points. Our estimates become roughly two times as large for the 75th percentile and range between 46 to 54 basis points. At the top (90th percentile) of the distribution,

our estimated effects are roughly six times as large between 152 and 168 basis points. Overall, our evidence suggests that the effect of procrastination decrease – instead of increasing – for those employees that save a lower fraction of their income, indicating that our results are not driven by liquidity constraints.

5.3 Allocations to Default Portfolio

There is no theoretical relation between procrastination and risk aversion, and thus it is not obvious that procrastination should affect an individual's preference for risky versus safe assets. However, given the propensity of procrastinators to stick with default options, there is a clear hypothesis regarding portfolio choice: procrastinators should be more likely to invest in a firm's default investment portfolio.

The Pension Protection Act of 2006 and subsequent regulations designated life-cycle, target date and balanced funds as Qualified Default Investment Alternatives (QDIAs). Prior to the PPA, firms that used automatic enrollment placed the assets of defaulters into a money market fund so as to ensure that the plan sponsor could not be held responsible for investment losses. Following the implementation of the QDIA regulations in December 2007, firms using auto-enrollment predominantly use one of the QDIA-designated fund types as the default portfolio option.

Empirically, this pre- versus post-QDIA change naturally lends itself to a difference-in-difference empirical design to identify the effect of procrastination on default behavior in the context of portfolio allocation. Specifically, prior to the adoption of the QDIA regulations, there is no reason to expect that funds later designated as QDIAs would be more or less likely to be

held by procrastinators. Following the PPA, however, procrastinators who worked for firms with defaults should be more likely to hold their portfolio in the firm's QDIA.

In Table 5, we report the results of this difference-in-difference analysis. The coefficient of interest is the interaction between procrastination and an indicator variable for being post-PPA (i.e., in year 2008). In columns (1) through (3), we use as a dependent variable the fraction of a participant's portfolio held in the likely QDIA. We find a significant coefficient on the interaction between being a procrastinator and being post-PPA. In other words, procrastinators are significantly more likely to invest in a QDIA fund after the PPA designated funds as such. Prior to the PPA, no such relation exists, exactly as we would expect if procrastinators are more subject to being defaulted. As a placebo test, we report in the Internet Appendix the result of defining the post-PPA variable as January 1st 2007. As expected, in this case we do not find an effect of procrastination on allocations to lifecycle funds.

In columns (4) through (6), we use a different dependent variable, equal to 1 if the individual holds 100% of their portfolio in the QDIA, and 0 otherwise. Once again, we find a statistically significant coefficient on the interaction effect, indicating that procrastinators are much more likely to be fully invested in the QDIA fund after it was designated as a default option.

Thus, consistent with the hypotheses put forth by other authors (e.g., Beshears et al 2009) that default behavior may be driven, at least in part, by procrastination, we find that procrastinators are significantly more likely to stick with the default investment portfolio.

5.4 Annuitization of DB Balances at Retirement

At retirement, a key decision is whether to take retirement plan benefits in the form of a lump-sum or an annuity. There is a very large literature on the theoretical value of insuring

longevity risk by purchasing an annuity that pays out for life (e.g., Yaari 1965; Davidoff, Brown and Diamond 2005), and also numerous papers exploring why so few individuals voluntarily purchase annuities when given the opportunity to do so (e.g., Benartzi, Previtero and Thaler 2011 and cites therein).

We are not able to observe annuitization within our DC plan data, which is not surprising given how few DC plans offer annuitization options. However, our data on DB plan participants allows us to study this question directly. Specifically, we examine over 27,000 DB plan participants who retired from 2002 through 2008. As discussed by Benartzi, Previtero and Thaler (2011), annuitization is substantially more common in DB plans than in DC plans: in our data, 49 percent of retirees take their benefit in the form of an annuity. We examine whether this probability differs between procrastinators and non-procrastinators.

In Table 6, we find that procrastinators are significantly less likely to annuitize. In columns (1) through (3), we find that procrastinators are 3.8 to 5.9 percentage points less likely to annuitize than are non-procrastinators, with two of the three specifications being statistically significant. This represents an approximate 8-12% reduction in the baseline probability of annuitizing one's DB plan.

For perspective, this is comparable to, or even a bit larger than, the 3.9 percentage point difference between men and women. With gender-blind pricing of annuities (as is the case with DB plans), the difference between men and women in the expected present discounted value of an annuity at age 65 is about 10 percentage points. Under the simplifying assumption that gender difference is annuitization are attributable solely to differences in the actuarial value, this suggests that procrastinators behave as if annuities were at least 10 percent more expensive.

In the next section, we will undertake a series of tests and robustness checks to strengthen the case that our results are driven by present-biased preferences leading to procrastination, rather than other possible stories. Our annuitization results in Table 6 provide some preliminary evidence in support of this case. We build upon the insights of Brown et al (2008) and Beshears et al (2014) who find that annuity demand is sensitive to whether the decision is framed as an investment or a consumption choice. The framing evidence suggests that the demand for annuities is larger in a consumption frame, in which annuities look like a valuable form of insurance, and smaller in an investment frame, which makes annuities look risky. Although we have no information about how the annuity v. lump-sum choice is communicated, we can take advantage of the fact that two-thirds of our plans are traditional DB plans that have historically paid benefits as monthly income and tend to communicate about the plans in these terms. The other one-third are "cash balance" plans which, although legally DB plans, communicate to employees in a decidedly investment-oriented manner, such as reporting account balances rather than monthly income.

We hypothesize that if procrastination is a manifestation of present-biased preferences, then procrastination should have an even larger effect on behavior when the lump-sum option is made more salient. Therefore, in our data, we hypothesize that procrastination's negative effect will be larger in cash balance plans (which are typically presented in an investment frame where the lump-sum is more salient) than in traditional DB plans (which are typically presented in terms of retirement income).

Columns (4) through (9) of Table 6 provide evidence that is consistent with our hypothesis. In columns (4) through (6), we show the results for cash balance plans. We find that procrastinators in cash balance plans, where the lump-sum option is more salient, are

significantly less likely to annuitize, with coefficients corresponding to an effect of 5 to 12.5 percentage points. In traditional DB plans, as reported in columns (7) through (9), we find no such relation. These results are consistent with the present-biased preferences leading individuals to be much less likely to annuitize than non-procrastinators when the decision is framed in a manner that emphasizes the lump sum.

6. Present-Biased Preferences as the Leading Explanation

To this point, we have established a strong empirical link between delaying until the last day to make a health care plan election, and a wide range of behaviors related to retirement planning. At the end of the last section, we also presented evidence about framing that is consistent procrastination being a manifestation of present-biased preferences. In this section, we provide further evidence in support of our hypothesis that the procrastination that we observe is a measure of present-biased preferences, and thus that present-bias is a fundamental contributor to understanding why so many individuals under-prepare for retirement.

6.1 Ruling Out Alternative Hypotheses: Optimal Delay

According to economic theory, present-biased preferences cause procrastination. The literature does not, however, suggest that present-biased preferences are the *only* cause of delayed decisions. A natural alternative reason for delaying decisions is that it may be rational to do so in order to maximize the information set that is available. For example, an optimizer may go online, learn about the options, and then take time to speak with friends and financial advisors, do online research, or and/or undertake extensive analysis before deciding. Such an

individual may wait until the last day to submit their decision not out of procrastination, but out of a desire to be exhaustive in their due diligence and account for all available information.

We can address this issue by making use of the rich record-keeping data that keeps track of individual employee interactions with the online health care plan election tool. As noted earlier, in addition to knowing the date of the final health care plan choice, we also know whether the individual made any prior submissions within the enrollment period, and then over-rode those earlier submissions with a final one on the last day of the period. Individuals who make multiple submissions are much more likely to be "optimal delayers" who were engaged in the decision-process prior to the end of the enrollment window. In contrast, individuals who had no online activity prior to the final submission on the final day are much more likely to be "present-biased procrastinators."

In Table 7, we examine this by including the direct and interacted effects of two variables: whether the individuals submitted on the deadline date and whether or not this was their first submission. Thus, the coefficient on "On Deadline" will correspond to procrastinators, whereas the sum of the "On Deadline" and the interaction with Submission>0 will capture the effect of optimal delayers. We report six columns, one corresponding to each of the outcomes we have examined in earlier tables. In this table we report results for the "Procrastination Ever" variable, while we report the results for the other two measures in the Internet Appendix.

In column 1, we examine days to join, using our OLS specification. We find that procrastinators take 65 days longer to join, consistent with our earlier results from Table 2. The interaction effect is -34, meaning that optimal delayers also take longer to join their 401(k), but delay a full month less than procrastinators. This makes sense: optimal delayers who take extra

time to make their health care decision may also take extra time to research their 401(k) participation decision, but understand that delay comes at a cost and thus limit it.

In column 2, we see that procrastinators joining in 2008 contribute 0.5 percentage points less than non-procrastinators. This effect is almost completely offset for optimal delayers, with an interaction term of +0.44.

In columns 3 and 4, procrastinators place 3.9 percentage points more of their portfolio in QDIA type funds and are 2 percentage points more likely to have their entire portfolio in these funds. In contrast, for optimal delayers, the coefficient on the interaction term is positive, with a magnitude that is about two-thirds as large as the effect for procrastinators, although insignificant.

In columns (5) and (6), we continue to find procrastinators are less likely to annuitize, especially in a cash balance plan. The coefficient on the interaction term is positive. In the cash balance plan specification (column (6)), we find that the coefficient fully offsets the negative effect of procrastination.

6.2 Ruling Out Alternative Hypotheses: Rational Inattention

When choices are relatively inconsequential, the theory of rational inattention suggests that it may be optimal for individuals to allocate their limited attention to other decisions (see Wiederholt, 2010 for a survey of the literature on rational inattention). For example, there may be some individuals for whom the choice among health care plans is relatively unimportant (e.g., if the plans do not differ along margins that are important given the individual's expected utilization). If so, then this would introduce noise in our measure of procrastination that would bias our findings toward zero.

It is harder, however, to suggest that the financial behaviors we observe are sufficiently inconsequential to justify rational inattention. To illustrate this, we construct a simple back-of-the-envelope calculation using the estimates above: a two-month delay in contributing each time one changes jobs (and assuming a job change very 7 years), a contribution rate reduced by 0.5% in the first year of each new job and a reduction of 0.15% thereafter, and a reduction in annuitization from 50 to 45% (assuming that annuitization increases one's consumption possibilities by 30%, the lower end of the values found in Mitchell et al 1999). Assuming an individual enters the workforce at age 22 and exits at 62, we find that, all else equal, procrastination reduces the consumption financed by the retirement plan by 5-10% relative to otherwise identical individuals that do not procrastinate. This assumes that procrastinators and non-procrastinators both join the plan, albeit with a delay in the case of procrastinators. The size of this reduction is magnified substantially if one accounts for a reduction in the possibility of ever joining the plan. We believe that decisions of this magnitude – a 5-10% reduction in all post-retirement consumption - are difficult to rationalize via a rational inattention story.

6.3 Ruling Out Alternative Hypotheses: Disorganized or Too Busy

Procrastination can also occur because a person is just disorganized or perhaps because the health care election and the retirement plan choices came at a time when the respondents were just very busy with their (new) job.

Stories like these could explain why someone who delays signing up for their health plan also never gets around to participating in their retirement plan, or delays signing up for it. They could also be used to explain why the person just goes with the default investment option, if they are too busy or disorganized to look into the alternative investment options that are available.

However, these alternative explanations do not explain why procrastinators – once they finally get around to signing up – contribute less to their plan, especially in firms without automatic enrollment (results from Table 3). In contrast, if procrastination is a manifestation of present-biased preferences, we would expect exactly this outcome. That is, people with a present bias are likely to value current consumption over future consumption to a greater degree than individuals without present biases.

Furthermore, these alternative stories do not explain the annuitization results. If people procrastinate because they are simply disorganized or very busy, there is no obvious reason that this should be correlated with whether to take the money as a lump sum or annuity. When a person retires, they have to choose one option or the other if they want to access their retirement money: unlike the decision of whether to participate in a 401(k), there is no implicit default option with regard to the decision on how to take distributions from the DB plan. In most firms, the act of retiring is a somewhat involved process that requires actively interfacing with a company's H.R. department. As such, the H.R. department can essentially force an individual to choose whether they want a lump-sum or annuity, and therefore need not construct a "default option."

In contrast, present-biased preferences have a clear prediction for annuity demand: because present-biased preferences underweight future consumption and overweight near term consumption, and such individuals should find annuities less valuable. This is exactly what we find in Table 6.

6.4 Ruling Out Alternative Hypotheses: Liquidity Constraints

Individuals with stringent liquidity constraints can be very busy in handling day-to-day demands on their limited resources (Shah, Mullainathan and Shafir, 2012; Mullainathan and Shafir, 2013). Therefore, they can procrastinate in health care elections (our measure of procrastination), in joining retirement plans, or in making decisions after joining (and hence be more likely to be assigned to default options). Moreover, when enrolled they could be willing to save less or when they retire they might be more likely to choose the lump sum to offset their liquidity needs.

While the liquidity explanation is consistent with most of our evidence, it is difficult to reconcile it with at least two results. First, it is not obvious why changing the frame of the annuity (cash balance vs. defined benefit plans) should generate any effect for those employees to whom liquidity needs and the need for a lump sum should already be pretty salient. Then, our evidence from quantile regressions that the effect of procrastination becomes about six times stronger for employees at the high end of the saving rate distribution (i.e, with annual contributions above 13% of their income) seems to contradict the hypothesis that liquidity constraints are a major driver of our results.

Nonetheless, we provide additional and more direct evidence on the potential role of liquidity needs. For 130,490 employees in DC plans (or 86% of our sample), we have information on their base pay (i.e., the fixed component of income) and the total income that includes also the potential variable part related to performance (e.g., bonuses). This allows us to control in our regressions for income levels and additionally to test if employees with lower income (and more likely to be liquidity constrained) drive our procrastination results. Therefore, in Table 8, we replicate our baseline specifications adding both indicator variables for total income quartiles and

– more important for our identification – interaction terms between procrastination and these income quartiles.

In Column 1, we find that the effect of procrastination on the delay in joining is statistically significant across all the income quartiles, with a meaningful lower estimate only for the high-income employees. For contribution rates in Column 2, the effect of procrastination seems to increase with income and it is not significant only for the low-income group. This result is easier to interpret if we consider that employees with high liquidity needs might not enroll in the retirement plan. For both measures of allocation to QDIA options in Columns 3 and 4, we also find that the results appear stronger for employees with above median income. In untabulated analyses, we find similar results if we use base pay instead of total income. Taken altogether this evidence suggest that the effect of procrastination is not driven by low-income employees.

We complement this analysis with FINRA Foundation's zip-code data on financial education and liquidity constraints. In the Internet Appendix, we report that financial education[5] is associated – as expected – with lower delay in joining, higher saving rates and lower investments in the default options. An index that proxy for liquidity constraints[6] has the opposite effect on these variables and increase the delay in joining, reduces savings and increases the allocation to the default options. More important for our interpretation of the results, the effect of procrastination remains largely unchanged by the addition of these two control variables.

[5] We follow the traditional approach of measuring financial education as a categorical variable between 1 and 5, based on the number of right answers to standard financial literacy questions about, among the others, compounding interest, inflation and riskiness of mutual funds vs. individual stocks.

[6] We construct an index that takes values between 1 (low) and 5 (high constraints) depending on information about: balance between income and expenses, use of payday loans or pawn shops, the absence of rainy-day funds and missed payments on credit card debt.

7. Robustness

7.1 Direct and Indirect Effects of Procrastination: Mediation Analysis

So far we have investigated the direct effect of procrastination on a host of outcomes related to financial preparation for retirement. Procrastination can operate also indirectly (i.e., through other covariates). For example, Tanaka, Camerer and Nguyen (2010) document that present-biased preferences are associated with lower income. If procrastinators earn less and this, in turn leads them to save less for retirement, then the effect of procrastination could both be direct and indirect.

We use mediation analysis to account systematically for this possibility.[7] In practice, following the seemingly unrelated regression model by Zellner (1963, 1964), we estimate the following set of equations separately for the four major outcomes analyzed in DC plans (y_{ip}) and the three empirical measures of procrastination:

$$y_{ip} = \eta_1 + \lambda_1 Procrastination_{ip} + \alpha Income_{ip} + \mathbf{\Omega}_1 Baseline\ Controls_{ip} + \varepsilon_{1ip} \quad \textbf{(2)}$$

$$Income_{ip} = \eta_2 + \lambda_2 Procrastination_{ip} + \mathbf{\Omega}_2 Baseline\ Controls_{ip} + \varepsilon_{2ip} \quad \textbf{(3)}$$

As in the previous specifications, we include in the *Baseline Controls*: gender, age (in five years increments), number of health care elections, and log of size of the firm. The direct effect of procrastination is estimated by λ_1 from Eq. (2). We obtain the indirect effect as the product $\lambda_2\alpha$, that is by multiplying the effect of Income from Eq. (2) with the estimates of the Procrastination on Income in Eq. (3).

[7] Our analysis is similar in spirit to Grinblatt, Keloharju, and Linnainmaa (2011)'s investigation of IQ and stock market participation. The authors document that roughly two-thirds of the total effect of IQ on participation are indeed indirect through education, income, and wealth.

In Table 9, we introduce the results of the mediation analysis using total salary as a proxy for income. For each outcome variable (here in rows), we first report the coefficient estimates and then below (in square brackets) the size of the effect relative to the total (direct plus indirect) effect. We assess the statistical significance of the direct and indirect effects using the delta method.[8]

The evidence from Table 9 suggests that while indirect effects are statistically significant, most of the influence of procrastination is direct and not mediated through income. Direct effects indeed account from a minimum of 70% of the total effect for the probability of being fully invested in QDIAs) to a maximum of roughly 95% for delay in joining. In the Internet Appendix, we use base pay instead of total income and we find very similar results with direct effects of procrastination in the order of three quarters of total effect.

7.2 External Validity

An attractive feature of using our measure of procrastination is that it can be used in other data sets where researchers have information on health care plan elections and financial behaviors. To take advantage of this, we obtained data from the University of Illinois human resources office for all individuals who joined the University system (including three major campuses and central administration) during 2010. Our sample includes 2,674 individuals that joined during the year and had 30 days to make their initial health care plan election. In this data, we define a "procrastinator" as someone who waits until the last day of their 30 day window to make their health care plan election. Note that we do not have information on whether

[8] Our results are robust to the use of bootstrapping methods (Preacher and Hayes, 2004; Zhao, Lynch, and Chen, 2010). In practice, the statistical significance of our results remains largely unchanged if we perform 10,000 repetitions with case resampling to follow the convention in this methodology and account for the fact that the indirect effects are generally non-normally distributed (i.e., usually positively skewed and kurtotic).

these individuals made earlier submissions in the enrollment period, and thus are unable to distinguish procrastinators from optimal delayers as in our main results.

As our dependent variable, we observe whether or not the individuals were participating in one or both of the voluntary, supplemental savings plans (a 403(b) plan, a 457 plan, or both) as of the final pay period in 2010. Summary statistics for this data are presented in Table 10, Panel A. In this data, just over a quarter of new employees (28.4%) waited until the last day to make their health care plan decision and are thus labeled as a procrastinator. Of newly hired employees in 2010, only 7.5 percent were participating in at least one of the plans as of the final pay period of 2010.

In Table 10, Panel B, we see that procrastinators are 2.4 percentage points less likely to participate, which is nearly one-third the size of the baseline participation rate of 7.5 percent. This estimate is remarkably stable if we add additional covariates, even if these covariates themselves are significant. For example, in Column 2 we find that women are approximately 3 percentage points less likely to participate than men and that being another year older increases the probability of participating by 0.4 percentage points.

Although we do not observe education *per se*, we know whether an individual is a member of the faculty or staff, a variable that is correlated with level of education. Analogously we can also compute a measure of financial literacy, based on whether an individual's department or occupation code was related to business, finance, accounting or economics.[9] Both our proxies of education and financial literacy are not significant drivers of the decision to participate in supplemental saving plans.

[9] Our definition of financially literate was chosen *ex ante* based on a list of department and occupation codes. The University Human Resources office then provided us with a simple binary indicator variable. Although this prevents us from engaging in further exploration of occupation differences, it was necessary to meet human subjects protocols to ensure that the researchers could not individually identify employees in the sample.

In unreported results, we replicate the mediation exercise in this sample and find that about one third of the 2.3 percentage point difference in supplemental savings plan participation can be explained by the direct effect of procrastination, whereas the remaining two thirds are due to procrastination operating indirectly through income.

8. Conclusions

Using a new empirical measure of procrastination that can be implemented in other administrative data sets on benefit elections, we present evidence that procrastinators behave differently from non-procrastinators in virtually every major step of financial planning for retirement. Specifically, procrastinators are less likely to participate in savings plans, take longer to sign up when they do participate, contribute less to their DC plans, tend to stick with default investment options, and are less likely to annuitize, especially when the decision is framed in an investment-oriented setting. These results, which derive from three different data sets covering a range of employers, are robust to including other controls and to various definitions of procrastination.

Our results are consistent with the leading view in economics that models procrastination as a manifestation of present-biased preferences. Although there are other reasons that individuals may delay decision-making, we discuss why these alternative hypotheses are unlikely explanations for the full set of findings. For example, none of the alternatives predict why individuals who delay decision-making are likely to contribute less (conditional on saving) or are less likely to annuitize, whereas these finding flows directly from present-biased preferences. We also distinguish directly between optimal delayers and present-biased procrastinators by using data on whether individuals were engaged in the decision process prior to the last day.

These results clearly indicate that non-optimizing procrastinators are making decisions that are, on average, detrimental to their future retirement security.

These results have wide-ranging implications. At an intellectual level, our results provide what is, in our view, the most direct and robust evidence to date in support of recent economic models of present-biased preferences. From a research perspective, our results suggest that measures of decision-making delays can be a good empirical measure of present-biased preferences. Our results are also relevant to policy makers and those responsible for designing retirement plans. For example, our evidence suggests that procrastination is an important underlying reason why default options (such as automatic enrollment in 401(k) plans) are so powerful. We also show that procrastinators are more heavily influenced by some aspects of plan design, such as the use of default investment portfolios. Knowing that present-based preferences are a pathway through which plan architecture matters is informative for how to design other behavioral interventions. For example, these results suggest that plan architects may find it fruitful to use tools to address procrastination and present-biases directly, such as through forcing choices, changing the incentives around deadlines, or increasing the salience of future payoffs. This should help guide future research on the relative efficacy of alternative plan design interventions.

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Table 1

Summary Statistics of Socioeconomic Characteristics

Panel A: Defined Contribution (DC) Plans

	All DC Employees (N = 154,870)				
	Mean	Median	Std. Dev.	Min	Max
Age at Hire	35.08	34	10.28	17.86	61.18
Female	0.44	0	0.50	0	1
Nr. Elections	2.40	2	1.50	1	7
Nr. Submissions	1.37	1	0.69	1	16
Size of Firm	70,698	48,626	46,835	8,923	201,673
Days to Enroll	184.85	30	345.17	0	1,825
Saving Rate	0.07	0.06	0.04	0.01	0.25
Share in QDIA fund	0.23	0	0.37	0	1
Pr(100% QDIA)	0.13	0	0.34	0	1
Procr. First	0.07	0	0.26	0	1
Procr. Ever	0.13	0	0.33	0	1
Procr. Always	0.03	0	0.18	0	1

Panel B: Defined Benefit (DB) Plans

	All DB Employees (N = 27,231)				
	Mean	Median	Std. Dev.	Min	Max
Age at Separation	59.70	60	4.86	49.00	75.99
Female	0.46	0	0.50	0	1
Tenure	26.15	28	10.06	5	56.00
Benefits Amount	270,447	167,399	361,682	5,005	5,591,010
Nr. Elections	2.73	2	1.74	1	7
Nr. Submissions	1.47	1	0.87	1	16
Annuity	0.42	0	0.49	0	1
Cash Balance Plan	0.39	0	0.49	0	1
Procr. First	0.04	0	0.20	0	1
Procr. Ever	0.08	0	0.28	0	1
Procr. Always	0.01	0	0.12	0	1

Table 1 Panel A provides summary statistics for socioeconomic characteristics for the employees enrolled in defined contribution plans. Table 1 Panel B provides similar summary statistics for the employees in defined benefit plans. All variables are defined in detail in the data section of the paper.

Table 2
Procrastination and Delay in Joining

Dependent Variable:	Days to Join			Days to Join (H_0: Coef. < 1)		
Model:	OLS			Cox Proportional Hazard Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Procr. First	50.603***			0.844***		
	(12.704)			(0.026)		
Procr. Ever		61.100***			0.822***	
		(10.845)			(0.022)	
Procr. Always			63.437***			0.819***
			(22.568)			(0.045)
Female	7.679	7.964	7.836	0.947***	0.946***	0.947***
	(5.452)	(5.457)	(5.427)	(0.016)	(0.016)	(0.016)
Age at Hiring	-11.097***	-11.020***	-11.100***	1.046***	1.046***	1.046***
	(1.479)	(1.475)	(1.482)	(0.007)	(0.007)	(0.007)
Health Elections (nr.)	73.011***	71.739***	73.818***	0.831***	0.835***	0.828***
	(11.517)	(11.168)	(11.775)	(0.028)	(0.027)	(0.028)
Size Firm (log)	3.200	2.131	3.159	1.111***	1.110***	1.112***
	(2.821)	(2.759)	(2.757)	(0.034)	(0.035)	(0.034)
Constant	-324.088***	-317.163***	-322.970***			
	(97.231)	(96.365)	(97.378)			
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	151,820	151,820	151,820	151,293	151,293	151,293
R-sq	0.294	0.296	0.294			

Table 2 reports results from regressions of the delay in joining the defined contribution plan on our three different measures of procrastination, demographic controls and indicator variables for retirement plans and years of enrollment. In Columns 1-3, we use OLS models and the coefficients can be interpreted as delay in numbers of days. In Columns 4-6, we use Cox proportional hazard models and the coefficients represent hazard ratios. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows:
* if p<0.10; ** if p<0.05; *** if p<0.01.

Table 3

Procrastination and Saving Rates (Employees joining in 2008)

Dependent Variable:	Saving Rate (as % of Income)								
Sample:	All DC Plans			DC Plans without Default Options			DC Plans with Default Options		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Procr. First	-0.473**			-0.563**			-0.147		
	(0.212)			(0.256)			(0.279)		
Procr. Ever		-0.490**			-0.577*			-0.112	
		(0.233)			(0.288)			(0.245)	
Procr. Always			-0.612*			-0.763*			-0.160
			(0.312)			(0.400)			(0.312)
Female	-0.331**	-0.332**	-0.332**	-0.368**	-0.369**	-0.369**	-0.269	-0.268	-0.269
	(0.137)	(0.138)	(0.138)	(0.141)	(0.141)	(0.142)	(0.302)	(0.302)	(0.302)
Age at Hiring	0.174***	0.175***	0.175***	0.149**	0.149**	0.149**	0.230***	0.230***	0.230***
	(0.044)	(0.045)	(0.044)	(0.056)	(0.056)	(0.056)	(0.021)	(0.021)	(0.021)
Health Elections (nr.)	-0.193**	-0.165**	-0.211**	-0.202*	-0.167*	-0.225*	-0.141	-0.137	-0.145
	(0.081)	(0.073)	(0.090)	(0.097)	(0.086)	(0.109)	(0.112)	(0.110)	(0.114)
Size Firm (log)	-0.113***	-0.110***	-0.107***	0.982***	0.973***	0.969***	-0.146***	-0.147***	-0.145***
	(0.021)	(0.023)	(0.025)	(0.060)	(0.065)	(0.067)	(0.033)	(0.032)	(0.034)
Constant	6.564***	6.499***	6.522***	-5.930***	-5.866***	-5.752***	6.629***	6.634***	6.629***
	(0.222)	(0.254)	(0.240)	(0.593)	(0.629)	(0.715)	(0.268)	(0.269)	(0.283)
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	27,016	27,016	27,016	17,697	17,697	17,697	9,319	9,319	9,319
R-sq	0.089	0.089	0.089	0.101	0.102	0.102	0.032	0.032	0.032

Table 3 reports results from regressions of the saving rate (as a fraction of total annual income) on our three different measures of procrastination, demographic controls and indicator variables for retirement plans. All the coefficients are scaled and represent the effects on saving rates in percentage points. In Columns 1-3, we report results for all the employees enrolled in 2008. In Columns 4-6, we limit our ananlyses to employees enrolled in DC plan with no default options; in Columns 7-9, we analyze employees from plans with default options. More details on our criteria to classify plans with or without default options are in the text. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows:
* if $p<0.10$; ** if $p<0.05$; *** if $p<0.01$.

Table 4
Quantile Regressions of Saving Rates (Employees joining in 2008)

Dependent Variable:	Saving Rate (as % of Income)											
Percentile:	25%			50%			75%			90%		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Procr. First	-0.237***			-0.125***			-0.462***			-1.563***		
	(0.053)			(0.019)			(0.088)			(0.233)		
Procr. Ever		-0.223***			-0.125***			-0.517***			-1.517***	
		(0.068)			(0.036)			(0.063)			(0.157)	
Procr. Always			-0.340***			-0.125***			-0.535***			-1.683***
			(0.066)			(0.024)			(0.112)			(0.244)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 reports results from regressions of the saving rate (as a fraction of total annual income) on our three different measures of procrastination for different quantiles of the saving rate distribution. Additional controls include: demographic variables and indicator variables for retirement plans. All the coefficients are scaled and represent the effects on saving rates in percentage points. These quantiles regressions are estimated for the entire sample of employees joning in 2008 (N= 27,016). Bootstrapped standard errors are in parentheses. Statistical significance is denoted as follows:
* if $p<0.10$; ** if $p<0.05$; *** if $p<0.01$.

Table 5
Procrastination and Asset Allocation (Difference-in-difference)

Dependent Variable:	Fraction in QDIAs			Pr(100% in QDIAs)		
Sample Period:	2002-08			2002-08		
	(1)	(2)	(3)	(4)	(5)	(6)
Procr. First	1.177*			1.073		
	(0.674)			(0.738)		
Procr. First x post PPA	10.572***			6.718***		
	(2.079)			(2.016)		
Procr. Ever		0.232			0.178	
		(0.698)			(0.737)	
Procr. Ever x post PPA		11.917***			4.653**	
		(2.981)			(2.174)	
Procr. Always			1.717			1.617
			(1.389)			(1.552)
Procr. Always x post PPA			10.881***			9.310***
			(2.833)			(2.732)
Post PPA	22.393**	21.841**	22.614**	13.328**	13.216**	13.393***
	(8.377)	(8.180)	(8.438)	(4.787)	(4.840)	(4.763)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	149,258	149,258	149,258	149,258	149,258	149,258
R-sq	0.378	0.378	0.378	0.267	0.267	0.267

Table 5 reports results from regressions of retirement asset allocation on our three different measures of procrastination, demographic controls and indicator variables for retirement plans and years of enrollment. "Post PPA" is an indicator variable equal to one after January 2008 (the likely implementation date of the Pension Protection Act). In Columns 1-3, we report results for the fraction of retirement wealth invested in qualified default investment alternatives (i.e., lifecycle funds). In Columns 4-6, the outcome variable is the probability of having all the retirement wealth invested in lifecycle funds. All the coefficients are scaled and represent the effects on asset allocation in percentage points. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows:
* if $p<0.10$; ** if $p<0.05$; *** if $p<0.01$.

Table 6
Procrastination and Annuitization

Dependent Variable:	Pr (Annuity)								
Sample:	All DB Plans			Cash Balance Plans			Traditional DB Plans		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Procr. First	-5.906***			-6.451***			-2.541		
	(1.661)			(2.249)			(1.886)		
Procr. Ever		-3.818**			-5.004***			-1.998	
		(1.452)			(1.481)			(2.134)	
Procr. Always			-4.031			-12.547***			5.614*
			(3.052)			(2.516)			(2.833)
Female	3.851***	3.883***	3.877***	4.941***	4.950***	4.976***	3.569**	3.588**	3.621**
	(0.965)	(0.965)	(0.971)	(0.930)	(0.934)	(0.945)	(1.403)	(1.397)	(1.404)
Age at Retirement	2.207***	2.208***	2.211***	2.869***	2.867***	2.872***	1.588***	1.589***	1.593***
	(0.411)	(0.411)	(0.412)	(0.648)	(0.649)	(0.647)	(0.319)	(0.319)	(0.320)
Benfits Amount	0.271***	0.271***	0.270***	0.291***	0.290***	0.291***	0.276***	0.276***	0.276***
	(0.058)	(0.059)	(0.059)	(0.090)	(0.090)	(0.090)	(0.072)	(0.072)	(0.072)
Tenure	0.118	0.119	0.119	0.043	0.040	0.042	0.215	0.217	0.216
	(0.271)	(0.271)	(0.271)	(0.125)	(0.124)	(0.125)	(0.395)	(0.396)	(0.395)
Health Elections (nr.)	-0.532	-0.454	-0.541	-2.325***	-2.256***	-2.457***	0.084	0.128	0.139
	(0.681)	(0.691)	(0.687)	(0.482)	(0.493)	(0.478)	(0.774)	(0.781)	(0.764)
Constant	-44.949*	-45.026*	-45.213*	-12.634	-12.186	-12.221	-10.925	-11.142	-11.194
	(25.521)	(25.573)	(25.493)	(37.158)	(37.223)	(36.929)	(29.280)	(29.369)	(29.297)
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Retirement Year Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	27,231	27,231	27,231	10,568	10,568	10,568	16,663	16,663	16,663
R-sq	0.444	0.444	0.443	0.405	0.404	0.405	0.473	0.473	0.473

Table 6 reports results from regressions of an indicator variable equal to one if the employee chooses an annuity on our three different measures of procrastination, demographic controls, and indicator variables for retirement plans and retirement years. All the coefficients are scaled and represent the effects on the probability of choosing an annuity in percentage points. In Columns 1-3, we report results for all the employees enrolled in defined benefit plans. In Columns 4-6, we limit our ananlyses to employees enrolled in cash balance plans; in Columns 7-9, we analyze employees from traditional defined benefit plans. More details on the difference between these two plan types are in the text. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows:
* if p<0.10; ** if p<0.05; *** if p<0.01.

Table 7
Procrastinators vs. Optimal Delayers

Period:	2002-08	2008			2002-08	
Sample:		Defined Contribution Plans			All DB Plans	Cash Balance
Dependent Variable:	Days to Join	Saving Rate	% in QDIAs	Pr(All in QDIAs)	Pr(Annuity)	
	(1)	(2)	(3)	(4)	(5)	(6)
On Deadline	64.872***	-0.503*	3.865**	1.978*	-4.169**	-6.534***
	(13.260)	(0.254)	(1.563)	(0.979)	(1.732)	(1.839)
On Deadline x I (Subm. >1)	-34.366**	0.441**	-2.589	-1.316	2.325	5.948**
	(13.180)	(0.164)	(1.891)	(2.510)	(1.518)	(2.311)
I (Submission>1)	-6.634	0.028	-1.375*	-3.045***	-0.586	-1.887**
	(5.413)	(0.066)	(0.669)	(1.078)	(0.604)	(0.850)
Demographic Controls	Yes	Yes	Yes		Yes	Yes
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Controls	Yes	No	No	No	Yes	Yes
N	151,820	27,016	26,020	26,020	27,231	10,568
R-sq	0.296	0.089	0.505	0.290	0.444	0.405

Table 7 reports results from regressions of the main retirement decisions previously analyzed. "On Deadline" is an indicator variable equal to one if the employee has *ever* made a health care election on the deadline date. "I(Submission>1)" is an indicator variable equal to one if the employee has made more than one health care submission during the election window. In Columns 2-6, all the coefficients are scaled and represent the effects on the outcome variable in percentage points. In Columns 1-4, we report results for employees enrolled in defined contribution plans. In Columns 5-6, we investigate decisions from employees enrolled in defined benefit plans. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows: * if $p<0.10$; ** if $p<0.05$; *** if $p<0.01$.

Table 8

Procrastination, Income and Retirement Planning (DC plans)

Period:	2002-2008	2008		
Dependent Variable:	Days to Join	Saving Rate	% in QDIAs	Pr(All in QDIAs)
	(1)	(2)	(3)	(4)
Procr. Ever X Income Q1	64.690***	0.009	1.835***	-2.080
	(16.314)	(0.078)	(0.610)	(1.418)
Procr. Ever X Income Q2	77.262***	-0.901***	2.969*	2.690
	(20.448)	(0.190)	(1.460)	(2.794)
Procr. Ever X Income Q3	65.010***	-0.870***	8.714***	8.916***
	(13.407)	(0.249)	(2.576)	(2.184)
Procr. Ever X Income Q4	40.990***	-1.285**	5.515	5.016
	(10.344)	(0.550)	(3.975)	(3.716)
Income Quartile Controls	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
Plan Controls	Yes	Yes	Yes	Yes
Year Controls	Yes	No	No	No
N	131,741	20,490	19,538	19,538
R-sq	0.339	0.133	0.467	0.253

Table 8 reports results from regressions of the retirement decisions in DC plans on our measure "Procrastination Ever" interacted with the different income quartiles. Additional controls include: demographic variables; indicator variables for income quartiles, retirement plans and - in Column 1 - years of enrollment. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows:
* if $p<0.10$; ** if $p<0.05$; *** if $p<0.01$.

Table 9

Procrastination and Income: Mediation Analysis

	Direct Effects			Indirect Effects	Total Effect	N
Independent Variables:	Procr. First	Procr. Ever	Procr. Always	Total Pay (Ln)		
Dependent Variable:						
Days to Join	66.77***			3.11***	69.88	130,490
	[95.5%]			[4.5%]		
		83.70***		5.35***	89.05	130,490
		[94.0%]		[6.0%]		
			79.26***	-0.75	78.51	130,490
			[101.0%]	[-1.0%]		
Saving Rate	-0.53***			-0.16***	-0.69	20,304
	[76.8%]			[23.2%]		
		-0.56***		-0.15***	-0.71	20,304
		[78.9%]		[21.1%]		
			-0.67***	-0.18***	-0.85	20,304
			[78.8%]	[21.2%]		
Fraction in QDIAs	8.29***			3.22***	11.51	19,348
	[72.0%]			[28.0%]		
		7.71***		2.79***	10.50	19,348
		[73.4%]		[26.6%]		
			10.31***	3.51***	13.82	19,348
			[74.6%]	[25.4%]		
Pr(100% in QDIAs)	4.96***			2.41***	7.37	19,348
	[67.3%]			[32.7%]		
		3.91***		2.09***	6.00	19,348
		[65.2%]		[34.8%]		
			7.08***	2.63***	9.71	19,348
			[72.9%]	[27.1%]		

Table 9 reports results from seemengly unrelated regressions of the retirement decisions in DC plans on our three measures of procrastination. Additional controls include: demographic variables (including income); indicator variables for retirement plans and - for the "Days to Join" outcome variable - years of enrollment. We report in square brackets the percentage of the "Total Effect" of procrastination that is due to the various "Direct" and "Indirect Effects". For more details on these estimates and the methodology used to compute direct and indirect effects refer to the text. N provides the number of observations used in each estimation. Standard errors are computed using the delta method. Levels of significance are denoted as follows:
* if $p<0.10$; ** if $p<0.05$; *** if $p<0.01$.

Table 10
Additional Evidence from the University of Illinois Supplemental Saving Plan

Panel A: Summary Statistics of Socioeconomic Characteristics

	All New UI Employees in 2012 (N = 2,678)		
	Mean	Median	SD
Age	38.12	35	10.2
Female	0.54	1	0.5
Faculty	0.17	0	0.38
Financial Literacy	0.03	0	0.18
Plan Participation	0.08	0	0.26
Procr. First	0.28	0	0.45

Panel B: Determinants of Plan Participation

Dependent Variable:	Plan Participation	
	(1)	(2)
Procr. First	-2.36**	-2.35**
	(1.12)	(1.11)
Female		2.99***
		(1.01)
Age		0.40***
		(0.05)
Faculty		-1.10
		(1.36)
Financial Literacy		0.72
		(2.83)
Constant	8.13***	-5.41**
	(0.60)	(0.021)

Table 10 Panel A provides summary statistics for socioeconomic characteristics for the new UI employees eligible to enroll in the supplemental saving plan. Table 10 Panel B provides results from regressions of an indicator variable equal to one if the employee is enrolled in the plan. Financial literacy is an indicator variable equal to one if the employee works in the business school, economics department or in the adminstrative financial services of the university. All the coefficients are scaled and represent the effects on the probability of participating in the supplementary retirement saving plan in percentage points. Robust standard errors are in parentheses. Statistical significance is denoted as follows:
* if $p<0.10$; ** if $p<0.05$; *** if $p<0.01$.

Procrastination, Present-Biased Preferences, and Financial Behaviors

Internet Appendix

by

Jeffrey R. Brown
University of Illinois at Urbana-Champaign and NBER

and

Alessandro Previtero
University of Texas at Austin

Table A.1

Procrastination and Saving Rates (Employees joining in 2002-2008)

Dependent Variable:	Saving Rate (as % of Income)								
Sample:	All DC Plans			DC Plans without Default Options			DC Plans with Default Options		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Procr. First	-0.103*			-0.105*			-0.098		
	(0.054)			(0.053)			(0.138)		
Procr. Ever		-0.116**			-0.123**			-0.096	
		(0.054)			(0.054)			(0.095)	
Procr. Always			-0.187*			-0.199*			-0.124
			(0.107)			(0.102)			(0.233)
Female	-0.421***	-0.422***	-0.422***	-0.451***	-0.452***	-0.451***	-0.092	-0.092	-0.093
	(0.110)	(0.110)	(0.110)	(0.110)	(0.110)	(0.110)	(0.200)	(0.200)	(0.200)
Age at Hiring	0.279***	0.279***	0.279***	0.283***	0.283***	0.283***	0.227***	0.227***	0.227***
	(0.026)	(0.026)	(0.026)	(0.029)	(0.029)	(0.029)	(0.018)	(0.018)	(0.018)
Health Elections (nr.)	0.047	0.050	0.044	0.060	0.063	0.057	-0.046	-0.044	-0.048
	(0.054)	(0.054)	(0.055)	(0.055)	(0.055)	(0.057)	(0.028)	(0.027)	(0.028)
Size Firm (log)	-0.489***	-0.487***	-0.488***	-0.571***	-0.569***	-0.570***	-0.173***	-0.172***	-0.172***
	(0.019)	(0.019)	(0.018)	(0.014)	(0.014)	(0.013)	(0.020)	(0.019)	(0.021)
Constant	11.724***	11.711***	11.718***	12.516***	12.506***	12.519***	8.867***	8.865***	8.862***
	(0.518)	(0.518)	(0.518)	(0.459)	(0.456)	(0.463)	(0.449)	(0.428)	(0.421)
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	152,372	152,372	152,372	138,301	138,301	138,301	14,071	14,071	14,071
R-sq	0.108	0.108	0.108	0.114	0.114	0.114	0.044	0.044	0.044

Table A.1 reports results from regressions of the saving rate (as a fraction of total annual income) on our three different measures of procrastination, demographic controls and indicator variables for retirement plans and enrollment years. All the coefficients are scaled and represent the effects on saving rates in percentage points. In Columns 1-3, we report results for all the employees enrolled between 2002 and 2008. In Columns 4-6, we limit our ananlyses to employees enrolled in DC plan with no default options; in Columns 7-9, we analyze employees from plans with default options. More details on our criteria to classify plans with or without default options are in the text. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows:

* if p<0.10; ** if p<0.05; *** if p<0.01.

Table A.2
Procrastination and Asset Allocation (Placebo Test)

Dependent Variable:	Fraction in QDIAs			Pr(100% in QDIAs)		
Sample Period:	2002-08			2002-08		
	(1)	(2)	(3)	(4)	(5)	(6)
Procr. First	1.296			0.831		
	(1.055)			(0.945)		
Procr. First x post PPA	3.658			3.220		
	(2.327)			(2.161)		
Procr. Ever		0.317			-0.163	
		(1.157)			(1.153)	
Procr. Ever x post PPA		4.368			3.024	
		(2.670)			(2.596)	
Procr. Always			1.391			0.817
			(1.514)			(1.359)
Procr. Always x post PPA			4.996*			5.278**
			(2.440)			(2.229)
Post PPA	22.802**	22.499**	22.872**	13.523***	13.316**	13.577***
	(8.436)	(8.384)	(8.448)	(4.813)	(4.866)	(4.799)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	149,258	149,258	149,258	149,258	149,258	149,258
R-sq	0.377	0.377	0.377	0.267	0.267	0.267

Table A.2 reports results from regressions of retirement asset allocation on our three different measures of procrastination, demographic controls and indicator variables for retirement plans and years of enrollment. "Post PPA" is an indicator variable equal to one after January 2007 (the year before the likely implementation date of the Pension Protection Act). In Columns 1-3, we report results for the fraction of retirement wealth invested in qualified default investment alternatives (i.e., lifecycle funds). In Columns 4-6, the outcome variable is the probability of having all the retirement wealth invested in lifecycle funds. All the coefficients are scaled and represent the effects on asset allocation in percentage points. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows:
* if $p<0.10$; ** if $p<0.05$; *** if $p<0.01$.

Table A.3

Panel A: Procrastinators vs. Optimal Delayers (Procrastination First)

Period:	2002-08	2008			2002-08	
Sample:		Defined Contribution Plans			All DB Plans	Cash Balance
Dependent Variable:	Days to Join	Saving Rate	% in QDIAs	Pr(All in QDIAs)	Pr(Annuity)	
	(1)	(2)	(3)	(4)	(5)	(6)
On Deadline	54.890***	-0.492**	4.214**	3.032**	-5.149**	-6.961**
	(14.363)	(0.234)	(1.680)	(1.336)	(2.060)	(2.498)
On Deadline x I (Subm. >1)	-32.591**	0.292	-1.671	1.922	1.629	5.975**
	(12.378)	(0.211)	(1.865)	(3.825)	(2.129)	(2.615)
I (Submission>1)	-7.976	0.061	-1.585**	-3.517***	-0.376	-1.563*
	(5.255)	(0.064)	(0.583)	(1.159)	(0.590)	(0.779)
Demographic Controls	Yes	Yes	Yes		Yes	Yes
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Controls	Yes	No	No	No	Yes	Yes
N	151,820	27,016	26,020	26,020	27,231	10,568
R-sq	0.295	0.089	0.505	0.290	0.444	0.405

Panel B: Procrastinators vs. Optimal Delayers (Procrastination Always)

Period:	2002-08	2008			2002-08	
Sample:		Defined Contribution Plans			All DB Plans	Cash Balance
Dependent Variable:	Days to Join	Saving Rate	% in QDIAs	Pr(All in QDIAs)	Pr(Annuity)	
	(1)	(2)	(3)	(4)	(5)	(6)
On Deadline	61.005**	-0.608*	4.997**	3.830***	-2.366	-10.178**
	(22.713)	(0.311)	(2.195)	(1.325)	(3.229)	(3.926)
On Deadline x I (Subm. >1)	-35.348***	0.231	-1.347	1.858	2.512	8.261
	(8.142)	(0.198)	(2.088)	(3.788)	(5.405)	(9.997)
I (Submission>1)	-9.348*	0.076	-1.656***	-3.425***	-0.463	-1.188
	(5.373)	(0.066)	(0.555)	(1.003)	(0.554)	(0.751)
Demographic Controls	Yes	Yes	Yes		Yes	Yes
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Controls	Yes	No	No	No	Yes	Yes
N	151,820	27,016	26,020	26,020	27,231	10,568
R-sq	0.294	0.089	0.505	0.290	0.443	0.404

Table A.3 reports results from regressions of the main retirement decisions previously analyzed. "On Deadline" is an indicator variable equal to one if the employee has made a health care election on the deadline date in ther *first year* of enrollment (Panel A) or in *every year* an election was made (Panel B). "I(Submission>1)" is an indicator variable equal to one if the employee has made more than one health care submission during the election window. In Columns 2-6, all the coefficients are scaled and represent the effects on the outcome variable in percentage points. In Columns 1-4, we report results for employees enrolled in defined contribution plans. In Columns 5-6, we investigate decisions from employees enrolled in defined benefit plans. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows: * if p<0.10; ** if p<0.05; *** if p<0.01.

Table A.4
The effect of Financial Literacy and Financial Hardship

Period:	2002-08			2008			2008			2008		
Dependent Variable:	Days to Join			Saving Rate			% in QDIAs			Pr(All in QDIAs)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Procr. Ever	56.391***	56.405***	61.024***	-0.489*	-0.484*	-0.470	3.261	3.233	3.108	0.188	0.111	0.113
	(12.803)	(12.821)	(12.895)	(0.280)	(0.277)	(0.285)	(2.040)	(2.033)	(2.065)	(1.146)	(1.156)	(1.227)
Financial Literacy		-1.927*	-0.548		0.076***	0.049**		-0.182	-0.061		-0.214	-0.123
		(1.100)	(1.214)		(0.026)	(0.020)		(0.202)	(0.204)		(0.258)	(0.213)
Financial Hardship		4.003**	1.395		-0.127**	-0.084		0.431***	0.286*		0.670***	0.581***
		(1.826)	(1.381)		(0.059)	(0.049)		(0.138)	(0.149)		(0.235)	(0.198)
Total Income (ln)			-54.966***			1.015***			-7.545***			-6.750**
			(16.143)			(0.350)			(1.558)			(3.016)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plan Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year Controls	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
N	100,930	100,885	92,445	15,052	15,035	13,807	14,306	14,289	13,071	14,306	14,289	13,071
R-sq	0.339	0.339	0.348	0.098	0.100	0.124	0.515	0.515	0.482	0.252	0.252	0.236

Table A.4 reports results from regressions of the main retirement decisions previously analyzed. "Financial Literacy" is a categorical variable between 1 and 5, based on the number of right answers to standard financial literacy questions about, among the others, compounding interest, inflation and riskiness of mutual funds vs. individual stocks. "Financial Hardship" is a categorical variable that takes values between 1 (low) and 5 (high constraints) depending on information about: balance between income and expenses, use of payday loans or pawn shops, the absence of rainy-day funds, and missed payments on credit card debt. "Demographics Controls" are the same demographic variables included in the main tables. In Columns 4-12, all the coefficients are scaled and represent the effects on the outcome variable in percentage points. All the results are for employees enrolled in defined contribution plans. Constant included in all specifications. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Statistical significance is denoted as follows:
* if p<0.10; ** if p<0.05; *** if p<0.01.