Saving for Retirement, Annuities, and Procrastination*

Jeffrey R. Brown† Alessandro Previtero ‡

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Abstract

There is a large dispersion in retirement wealth and in the propensity to annuitize. We provide evidence that the tendency to procrastinate could help explain these differences. Empirically, we define a procrastinator as one who waits until the last day of their health care open enrollment period to make a plan election. In defined contribution plans, procrastinators take longer to sign up for 401(k) plans, contribute less, and are more likely to stick with default portfolio allocations. In defined benefit plans, procrastinators retire earlier 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 results are best explained by procrastination being the outcome of present-biased preferences. Our findings help explain the power of default options and have implications for the design of policies created to delay retirement or promote annuitization.

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†University of Illinois at Urbana-Champaign and NBER.
‡Indiana University and NBER.

In 2018, retirement assets in the United States amounted to 27.1 trillions (Investment Company Institute 2019). A growing fraction of these assets—currently about 60%—is invested either in defined contribution plans (DC) or individual retirement accounts (IRAs). In these retirement plans, workers have great autonomy in deciding how much to save and how to invest their retirement wealth. This autonomy is even larger after retirement when employees can decide how much to withdraw and if to insure against the longevity risk using annuities. There is a wide and increasing dispersion in retirement wealth and in spending rates after retirement (Poterba, Venti, and Wise (2011); Poterba (2014)), the causes of which are numerous and still debated in the literature.

We investigate if the tendency to procrastinate can explain differences in the accumulation and decumulation of retirement wealth. In our baseline estimates from defined contribution plans, we document that procrastinators take two months longer to start saving for retirement, save 0.5% less of their annual income once they begin saving, and have 10% more of their retirement wealth invested in the default asset allocation. Analyzing payout data from defined benefits plans, we document that procrastinators retire nine months earlier and are five percentage points more likely to choose a lump sum distribution over an annuity, with this latter effect being stronger when the lump sum is made more salient. From back-of-the-envelope calculations, we estimate that procrastinators could experience a reduction between 15 and 20% of consumption after retirement. Additional tests confirm that our procrastination measure likely captures present-biased preferences more than reflecting liquidity constraints, financial naïvetè, being busy, or rationally delaying decisions.

Procrastination has received significant attention in the psychology literature. Harriott (1996) provide evidence that procrastination is widespread, with chronic procrastination affecting as many as one in five adults. Because researchers have documented the stability of procrastination tendencies across time and situations, some psychologists consider procrasti-

nation to be a personality trait that is at least in part biological or genetic in nature (Arvey, Rotundo, Johnson, and McGue (2006)). Steel (2007) classifies procrastination as one aspect of conscientiousness, which is itself considered to be one of the "Big Five" personality traits in the psychology literature.

Among economists, Akerlof (1991) models individuals as overweighting near-term costs and heavily discounting future costs. Building on these insights, O'Donoghue and Rabin (1999a) coined the term "present biased preferences" to refer to the broad class of models—including Laibson (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. In their model, a person with present-biased preferences—and who is not sophisticated enough to recognize this proclivity—will tend to procrastinate in the face of near-term costs of action. Psychologists and economists seem to agree that the tendency to procrastinate is likely to play a bigger role in decisions that are more important (O'Donoghue and Rabin (1999b) and O'Donoghue and Rabin (2001)) and when consequences will manifest far away in time (Steel 2007), characteristics that clearly apply to retirement saving and decumulation decisions. We, therefore, test if procrastination is a key factor in explaining retirement-related behaviors.

Following these two streams of literature, we hypothesize that the tendency to procrastinate is generally enough (i.e, like a personality trait) that individuals will manifest it across different yet analogous settings. In practice, we define as procrastinators those employees that have initiated and concluded a health care election during the last available day of the yearly enrollment window (typically 30 days). Therefore, our measure of procrastination comes from actual and consequential decisions. Moreover, our measure is portable, in the sense that can be easily replicated in different settings. We confirm this claim by replicating

some of our main results in a completely different sample, using data from University of Illinois employees.

Individuals could procrastinate because they have time-inconsistent or present-biased preferences—our preferred interpretation of the overall evidence in this paper. Nonetheless, they could also procrastinate because they are busy, disorganized, financially unsophisticated or liquidity constrained, and hence needing more time to make their elections. Alternatively, they could rationally optimize and defer until the last day to choose their elections to maximize their information set. We devote several analyses to distinguishing among these alternative interpretations of our evidence.

Using data on over 154,000 employees from 27 defined contribution plans, we document that procrastinators take between 50 to 63 days longer to join their retirement plan and that when they join they save 0.4% to 0.6% less of their annual income. Quantile regressions on saving rates document that the negative effect of procrastination increases at higher saving rates (from 0.3% to 0.7% going from the bottom quartile to the highest decile of the saving rate distribution). Using data from over 27,000 employees from 63 defined benefit plans we investigate decisions related to timing of retirement and annuitization. Procrastinators tend to retire five to 13 months earlier. When they retire they are four to six percentage points less likely to choose an annuity.

To identify the causal effect of procrastination on any financial behavior we would ideally investigate an exogenous shock to this tendency and measure its consequences. Unfortunately, given that the tendency to procrastinate is considered a stable personality trait, such shifts might rarely or never occur. In this paper, we use an alternative empirical strategy and document that treatments that should increase or counteract biases affect procrastinators

and non-procrastinators differently.[1] In practice, in our identification strategy we use two different treatments: i) a regulatory change in the endorsed default asset allocation in defined contribution plans introduced by the Pension Protection Act in 2007, and ii) the different frame (i.e., way of presentation) of retirement wealth used in traditional defined benefit vs. cash balance plans. First, we show that following the Pension Protection Act's endorsement of lifecycle funds as the default investment option, procrastinators have 10% more of their retirement wealth invested in this default option compared to non-procrastinators. Second, we document that employees retires six to nine months earlier and are about six to 16 percentage points less likely to select annuities in retirement plans where benefits are presented as retirement wealth (cash balance plans) instead of retirement income (traditional defined benefit plans).

After presenting evidence from these two quasi-natural experiments, we introduce several robustness checks that confirm procrastination stemming from present-biased preferences as the most likely explanations of all our results. More in details, we document that our results are difficult to reconcile with procrastinators: i) rationally delaying their elections; ii) just suffering from liquidity constraints or iii) being less financially sophisticated. Although the tendency to procrastinate is associated with lower income and lower financial sophistication, the results of a mediation analysis confirm that procrastination has a strong direct effect on retirement-related financial decisions. We conclude our analysis replicating our major findings using novel data from the University of Illinois supplemental saving retirement plans.

[1]More formally, if the treatment is jointly independent from the tendency to procrastinate and potential omitted variables, then our estimate of the interaction between the treatment and procrastination is consistent—even if the the estimate of the main effect of procrastination is biased (see, for example, Blank (1991), Nizalova and Murtazashvili (2016), or Goda, Levy, Manchester, Sojourner, and Tasoff (2015)). We discuss how realistic this assumption is in our two quasi-natural experiments in section IV.A and section IV.B).

Our papers contributes to different strands of literature. First, our evidence adds to the growing literature that investigate the large dispersion in retirement wealth and the welfare costs associated with the increased investor autonomy in defined contribution plans (e.g., Choi, Laibson, Madrian, and Metrick (2009); Benartzi and Thaler (2007). We document that differences in the tendency to procrastinate can have a material impact on the dispersion of retirement wealth. From back-of-the-envelope calculations, the tendency to procrastinate can explain between 15 and 20% of consumption after retirement. Our analysis is similar in spirit to those studies that document the effect of individual characteristics on financial decisions. For example, Kuhnen and Melzer (2018) show that non-cognitive abilities such as self-efficacy can predict household defaults. Stango and Zinman (2019) find evidence that individual exponential growth bias has an impact on borrowing and saving decisions.

Second, many studies have documented large effects of default options in saving for retirement decisions (Chetty, Friedman, Leth-Petersen, Nielsen, and Olsen (2014)) and default effects are considered the strongest empirical evidence in applied economics in the last 20 years (DellaVigna (2009)). Nonetheless, why do defaults work has remained until recently largely unexplored. For example, default options could work because of endorsement effects or because appealing to time-inconsistent individuals. Our work supports this latter explanation. Our results nicely dovetails with evidence on short-term saving in Blumenstock, Callen, and Ghani (2018). We complement their results, providing evidence on long-term saving decisions and offering potentially useful guidance for the design of DC Plans. Our evidence supports the notion that present-biased preferences might play a major role in making defaults effective (Beshears, Choi, Laibson, and Madrian (2008)). From a policy perspective, our results make the use of default options even more attractive as they are more likely to influence individuals that would have otherwise not joined retirement plans and—after joining—saved less or not change their allocation.

Third, our evidence sheds some light on the potential reason why annuities are not as appealing as economic models would predict, the so-called annuitization puzzle (Yaari (1965) and Davidoff, Brown, and Diamond (2005)). Our result that present-biased preferences could explain low annuitization rates supports the notion that behavioral factors could help solve the annuitization puzzle (Brown (2007) and Benartzi, Previtero, and Thaler (2011)). Our findings also imply that presenting plan benefits as retirement income—and not as retirement wealth as currently done in DC plans—could actually promote later retirement or increase annuitization rates.

Finally, many theoretical papers have hypothesized a direct link between present-biased preferences, procrastination and actual behaviors (Laibson (1997); O'Donoghue and Rabin (1999a), O'Donoghue and Rabin (1999b), O'Donoghue and Rabin (2001); Fudenberg and Levine (2006), Fudenberg and Levine (2012). Nonetheless, empirical evidence consistent with present-biased preferences is still limited and largely experimental (Madrian and Shea (2001); Reuben, Sapienza, and Zingales (2010); Meier and Sprenger (2010)). Using survey measures, recent studies have identified a potential role for present-biased preferences in explaining retirement savings (Goda, Levy, Manchester, Sojourner, and Tasoff (2015)) and wealth accumulation (Stango and Zinman (2019)). Survey elicitation of present-biased preferences are generally very noisy and display low correlation in repeated measurements (Goda, Levy, Manchester, Sojourner, and Tasoff (2015)). Our paper contributes to this literature by using a measure of procrastination derived by actual and consequential health care elections and linking it to actual behaviors in saving for retirement, timing of retirement and payout decisions. Our approach is similar in spirit to Kuchler and Pagel (2018) that investigate the role of present bias for credit card paydown, using the sensitivity of consumption to paycheck receipt as a proxy for short-run impatience.

The papers proceeds as follows. In section I we describe our data and introduce our measure of procrastination. In section II we present our empirical strategy. In section III we introduce the main evidence from defined contribution and defined benefit plans. In section IV we refine the identification of our main results using two quasi-experimental settings. In section V we conduct several robustness checks. Section VI concludes.

I. Data Overview

A. Data Description

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 elections. As discussed in the next section, we use this information to create our proxies for procrastination.

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 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 I Panel A shows that the average age of those joining the firms is just around 35 years, with a slight majority male, and an average salary of US $57,460. These are very large plans from large firms, with over 70,000 employees per firm.

A second data set, provided by the same retirement plan record-keeper, allows us to observe the annuity versus lump-sum decisions of 26,864 individuals retiring between 2002 and 2008 from 63 defined benefit (DB) plans, offered by 37 different firms. Table I Panel B

shows summary statistics for this 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 age at separation of 59.7 years. These payout decisions are likely to be the major retirement choices for many employees in our sample, given that the average tenure at the firm is 26.2 years and the benefit amounts are equal to roughly US $ 270,000. 61% of employees separate from traditional defined benefit plans, where the benefits are presented as retirement income, while the remaining 39% from cash balance plans, where the benefits are presented as retirement wealth. We use this difference in the framing of retirement benefits in section IV.B.

In our robustness section V.F, we 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 and, ultimately, our main findings.

B. Defining Procrastination

The same retirement plan record-keeper provided also information on the timing of the health care elections made by all the employees enrolled in the DC and DB plans in our sample. 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.[2]

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 health care plan election choice in the year of hire. Although we do not know what specific elections employees make, we know all the time-stamps of all their interactions with the online health care system and when they have finalized their elections. Using this information, we create three different measures to proxy for procrastination.

Procrastinator First is an indicator variable equal to one if an individual waited until the last day to make their initial plan election at the time of first eligibility. Because we observe individuals in multiple years, we can also create additional measures of procrastination based upon whether employees exhibit procrastination tendencies over multiple years. *Procrastinator Ever* is an indicator variable equal to one if in any year from the point of hiring through the end of our data, the individual has at least one year in which they wait until the last day to submit their health care plan election. *Procrastinator Always* is equal to one if employees wait until the last day in every year in which they made a selection. Naturally, the *Procrastinator Ever* measure will label more employees as procrastinators, whereas the *Procrastinator Always* measure will label fewer employees as procrastinators. In Table I panel A, we report that in our DC sample we define as procrastinators a fraction of employees that varies from 12.5% for *Procrastinator Ever* to 7.3% for *Procrastinator First* and 3.4% for *Procrastinator Always*. In our DB sample (same table, panel B), these fractions are 8.4%, 4.2% and 1.4%, respectively.

[2]In table II, we find that being a procrastinator in past healthcare elections is the best predictor for being a procrastinator again in the future. This evidence supports our intuition that our measure is indeed capturing a more stable personality trait or tendency.

We have also constructed two additional measures of procrastination: i) *Procrastinator Last* that equals one if the individual procrastinates the last time they made a plan election; and ii) *Procrastinator Mean* that corresponds to the fraction of all health care plan elections made on the last day. In unreported analyses, we find very similar results using these two additional measures.

In Table I, we compare procrastinators and non-procrastinators, using the most restrictive of these definitions, *Procrastinator Always*. In DC plans (panel A), we find that while there is no significant difference in gender and salary, procrastinators are 1.1 years younger (t-stat= -7.6). Analogously, procrastinators are less likely to make health care elections (-1.3, t-stat= -62.6) and, conditional on making a new election, less likely to submit more than one election in each enrollment window (-0.4, t-stat= -40.2). This evidence suggests that our measure of procrastination could miss the worst procrastinators, that might not get around to submit their health care elections in the first place. In term of saving behaviors, procrastinators take 73 days more to join the retirement plan, they save 0.4% of their annual income less, have a higher fraction of retirement wealth invested in the default investment option (12%) and are nine percentage points less likely to have all their money in the default option. All these differences are highly statistically significant.

In the defined benefit sample (panel B), we find that procrastinators are more likely to be men (7.2%, t-stat= 2.7) with a shorter tenure at the firm (-1.2 years, t-stat = -2.3). While we find no differences in salaries and benefits amount, also in this sample procrastinators are less likely to submit a health care election (-1.6 with t-stat=-17.5) or to make multiple elections in a given year (-0.5, with t-stat=-10.3). With respect to retirement decisions, procrastinators tend to retire 1.6 year sooner and are 5.9 percentage points less likely to select an annuity at separation. For comparison, in our sample the average probability of choosing

an annuity is equal to 42.2%. All these differences are both statistically and economically significant.

We acknowledge that our measure of procrastination is likely to be a noisy proxy for present-biased preferences. Individuals might wait until the deadline to make their health care elections for several reasons. For example, they might simply be disorganized, too busy or rationally wait until the last day available. While we explicitly address all these alternative explanations in section V, we note here that we define employees as procrastinator if they wait until the very last day of their open enrollment period to make their election and if they have no prior interaction with the online system during that period.[3]

II. Empirical Strategy

A. The Anatomy of Procrastinators

Analyzing all healthcare elections between 2002 and 2008, we first investigate who is more likely to procrastinate. Our outcome variable is an indicator variable equal to one if an employee has ever made a health care election on the deadline. This variable corresponds to the measure *Procrastination Ever* previously described, with means equal to 12.5% in DC plans and 8.4% in DB plans. We report our results in table II. In DC plans, procrastination is associated with lower age and higher salary (column 1). Being five year older reduces the probability of procrastinating by 0.1 percentage points, while one standard deviation variation in income increases this probability by 0.5 percentage points. In column 2, we restrict the sample to employees who have made more than one health care election to control for the effect of past procrastination. This variable is highly economically and statistically significant. Procrastination in past elections increases the likelihood to procrastinate in

[3]In our robustness section V.A, 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.

current elections by 12.1 percentage points, almost doubling the baseline probability (12.5%). The results are robust across DC plans with or without default options.[4]

We find similar results in DB plans. Age is negatively correlated with procrastination, but the effects are very small. Being five years older reduces the probability to procrastinate by 0.1 percentage points. Being a procrastinator in past elections strongly predict current procrastination, with an increase in the likelihood of waiting until the deadline that increases by 8.5 percentage points, again doubling the unconditional probability (8.4%). Results are robust across traditional DB plans and cash balance plans. In both DC and DB plans, procrastination is negatively correlated with the number of health care elections made during our sample period. This finding suggests that our measure might be missing the most severe procrastinators that do not submit the elections at all. Overall, this analysis documents how the tendency to procrastinate is largely uncorrelated with demographic traits and fairly stable over time. This evidence support the hypothesis that our measure is likely to reflect a relatively stable personality trait. After this validation exercise, we investigate if procrastination could help to predict actual retirement choices in saving for retirement or payout decisions.

B. Basic Specification

Our baseline specification is as follows:

$$y_{i,p} = \alpha + \beta procrastination_{i,p} + \Delta X_{i,p} + \gamma_p + \omega_t + \epsilon_{i,p} \quad (1)$$

where y is the retirement-related financial behavior of individual i from the p plan. *Procrastination* is one of the various procrastination measures identified above. $X_{i,p}$ is a vector of socio-demographic and plan controls that includes: i) age (measured in 5-year increments

[4]We define our methodology to identify retirement plans with or without default options in section III.B.

starting at 18); ii) salary (standardized); iii) the number of health care plan elections made by the individual in our sample period; iv) the log of firm size at the timing of joining. We also include fixed effects for retirement plans (γ_p) and year of enrollment in 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.

In section V.C, we also 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.

In the Internet Appendix, we run additional analyses to account for the fact that the tendency to procrastinate might also affect income (Tanaka, Camerer, and Nguyen (2010)).

III. Main Results

We examine several key behaviors related to financial planning for retirement. We present our results roughly in the order that an individual faces these decisions over their lifecycle. We begin with our DC sample by examining how long it takes an individual to sign up for a 401(k) plan and how much a participant chooses to contribute as a percent of pay. Then, we will turn to our DB sample to investigate when individual decide to retire and whether they select and annuity or a lump-sum as a payout.

A. DC Plans: Time to Enroll

In the first three columns of Table III, we introduce 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.

We limit this analysis to employees that eventually sign up within five years of their hiring 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 roughly 50 to 62 days longer to sign up for a 401(k) plan than non-procrastinators. To put this magnitude in perspective, if an employee changes jobs five-six 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 (6), 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 for procrastinators.

B. DC Plans: Contribution Rates

In Table IV, panel A, 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 that 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 44 to 59 basis points per year less than non-procrastinators. This corresponds to a 6.1 to 8.2% reduction in contributions relative to the baseline rate of 7.2%.

Prior research has shown that firms that using automatic enrollment is often associated with many participants contributing 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, Choi, Laibson, and Madrian (2008), then this would make it harder to find an effect of procrastination on saving rates. To address this possibility, we create an empirical proxy for which firms have auto-enrollment.[5] 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 54 to a 75 basis point reduction in contribution rates, or a reduction between 7.5 to 10.6% 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 IV 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 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 IV 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

[5]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); and 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 using different cut-offs (20 and 10%), a nice feature of the 30% rule is that we generate aggregate plan-year patterns of default option adoptions that compare to the frequency of default adoption by large plans, reported by PLANSPONSOR. In 2003, for example, we estimate that four 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.

auto-enrollment. However, the effect is substantially mitigated, with saving rates lower by 10 to 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 IV, panel B, 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 V.C, 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 should be more prevalent.

We find that the effect of procrastination become larger as we move across the saving rate distribution from the bottom 25^{th} percentile (with saving rates of 5% of the annual income) to the 75th percentile (with rates of 9%) or the 90^{th} percentile (where rates are at 13%). Depending on the measure of procrastination, we estimate procrastination effects at the 25^{th} percentile between 33 to a 43 basis points. We find similar or slightly bigger estimates for the 75^{th} percentile (between 42 to 45 basis points). At the top (90^{th} percentile) of the distribution, our estimated effects are roughly two times as large between 64 and 72 basis points. Overall, our evidence suggests that the effect of procrastination is constant or decreases—instead of increasing—for those employees that save a lower fraction of their income, indicating that liquidity constraints do not likely drive our results.

C. DB Plans: Timing of Claiming Benefits

Using our data from 63 defined benefit plans, we investigate the effects of procrastination on the timing of retirement. Present-biased preference models would predict that individuals would procrastinate on activities that have upfront costs and delayed benefits, and being impatient on activities that involve upfront benefits and delayed costs O'Donoghue and Rabin (1999a). In Table V, we regress the age at which employees start claiming their retirement benefits on our measures of procrastination, demographic characteristics (gender, benefit amount, salary) and plan and retirement years fixed effects. In columns (1) to (3), we present results for the overall sample. We find that being a procrastinator is associated with retiring 0.4 to 1.1 years earlier. The magnitude of the effects of procrastination appear substantial, if we consider, for example, that one-standard deviation increase in salary is associated with working 0.4 years less. In our DB sample, we include employees that are 50 years or older. For robustness check, we repeat our analysis for employees that are 55 years and older in columns (3) to (5) or 60 years and older in columns (6) to (8). These ages are likely to serve as focal points, given that the tax penalties of withdrawing retirement benefits early are reduced at 55 and completely eliminated at age 60. Although smaller in magnitudes, our results are largely confirmed in these older subsamples (only one of the six coefficients is not statistically significant at conventional levels). Overall, these results are consistent with our measures of procrastination on health care elections capturing individuals with present-biased preferences.

D. DB Plans: Annuitization 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 directly study this question. Specifically, we examine 26,864 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, 42.2 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 VI, we find that procrastinators are significantly less likely to annuitize. In columns (1) through (3), we find that procrastinators are 3.9 to 6.0 percentage points less likely to annuitize than are non-procrastinators, with two of the three specifications being statistically significant. This represents an approximate 9-14% reduction in the baseline probability of annuitizing one's DB plan.

For perspective, this is comparable to, or even a larger than, the 3.6 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 differences in 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 columns (4) to to (9) we replicate these analyses, restricting the sample to employees retiring after the age of 55 or 60, two focal points given the changes in tax penalties of

withdrawing retirement benefits around these ages. We find similar results—if anything, bigger—for those employees less likely to retire early and incur tax penalties. This evidence also suggests that employees retiring earlier and possibly in need of financial resources are not driving our results.

IV. Strengthening Identification

So far, we have demonstrated that procrastination is correlated with important retirement saving and annuitization outcomes. In DC plans, being a procrastinator on health care elections is associated with starting to save later and with saving less. In DB plans, our measure of procrastination is correlated with retiring earlier and a higher probability of choosing a lump sum as a payout option. In this section, we strengthen our approach to identifying causal effects. In our setting, the identification challenges are extremely difficult to directly tackle. For example, our previous estimates could be biased if we have an omitted variable (e.g., financial literacy or liquidity constraints) that is potentially correlated with both the tendency to procrastinate on health care elections and the retirement-associated decisions that we have investigated (Angrist and Pischke 2008).

In section V we try to directly control for potential omitted variables such as financial sophistication or liquidity constraints. Nonetheless, our proxies can be noisy and we cannot exclude that there are other relevant variables that we cannot observe and, hence, omit from our analyses. The cleanest identification strategy would require to exogenously vary the tendency to procrastinate (or present-biased preferences) and, then, to measure retirement-related behaviors. Unfortunately, the tendency to procrastinate is a relatively stable personality trait, making it difficult to identify any shock that could—exogenously or not—change this tendency. Given this constraint, we use an alternative empirical strategy and show that treatments that could enhance or reduce the bias have heterogenous effects between procras-

tinators and non-procrastinators. For example, the Pension Protection Act's designation of lifecycle funds as the default asset allocation should cause procrastinators to invest more in these funds, compared to non-procrastinators. Analogously, making the lump sum less salient should reduce its take-up rates more for procrastinators than non-procrastinators.

A. The Pension Protection Act and Allocations to the Default 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 the probability of investing in the default asset allocation. In practice, we estimate the following equation:

$$y_{i,p} = \alpha + \beta_1 procrastination_{i,p} + \beta_2 procrastination_{i,p} \times postPPA + \Delta X_{i,p} + \gamma_p + \omega_t + \epsilon_{i,p} \quad (2)$$

where y is a measure of the allocation to likely QDIAs of individual i from the p plan. *Procrastination* is one of the various procrastination measures identified above. Post PPA is an indicator variable equal to one starting on January 1st, 2008. $X_{i,p}$ is a vector of socio-demographic controls and γ_p and ω_t are retirement plan and calendar year of enrollment fixed effects. Although the main coefficient of the effect of procrastination, β_1, could be biased,

the interaction term, β_2, is still consistent if the treatment *post PPA* is jointly independent from the tendency to procrastinate and potential omitted variables.[6]

We do not have random assignment of employees in retirement plans before and after the PPA. Nonetheless, cohorts of employees entering the workforce and joining the retirement plans in subsequent years should be very similar along socio-demographic characteristics, tendencies to procrastinate and unobservable characteristics. For example, Madrian and Shea (2001) investigate the effect of auto-enrollment features on employees' participation rates in 401k plans. Their identifying assumption is that cohort of employees hired in consecutive years are similar also among unobservable characteristics. Moreover, our results from Table II document how the tendency to procrastinate seems to be a stable personality trait that is only weakly correlated with socio-demographics characteristics.

In Table V, we report the results of this difference-in-difference analysis. In columns (1) through (3), we use as a dependent variable the fraction of a participant's portfolio held in the likely QDIA. The coefficient of interest is β_2, the interaction between procrastination and post-PPA. We find a significant coefficient for this interaction term: procrastinators are 9.6 to 10.9 percentage points more likely to invest in a QDIA fund after the PPA designated funds as such. These effects are statistically and economically significant, given that the fraction of retirement wealth invested in QDIAs in our sample is equal to 23.2%.

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. We find statistically significant coefficients for two out of the three measures on the interaction effect, indicating

[6]Nizalova and Murtazashvili (2016) formally show this result. Our approach is similar in spirit to Blank (1991) or Goda, Levy, Manchester, Sojourner, and Tasoff (2015). The former study investigates the effect on economic journal acceptance rates of randomly assigning authors to single or double-blind refereeing. While the main effects of gender or university rank on acceptance rates are likely to be biased (because of omitted variables), the interaction terms are still consistent given the random assignment. Similarly, in the latter study the authors design a randomized bias-reducing treatment to investigate the effects of present-biased preferences and exponential-growth bias in retirement savings.

that procrastinators are much more likely to be fully invested in the QDIA fund after it becomes the default option.

In Figure I, we document how prior to the PPA, procrastinators and non-procrastinators are equally likely to invest in QDIAs. In other words, the parallel pre-trend assumption holds for both our outcome variables. After the implementation of the PPA, procrastinators become more likely to invest in QDIAs. As a more formal placebo test, we report in table A.2 (in the Internet Appendix) the results 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 QDIA funds or the probability of being fully invested in QDIAs.

There is no theoretical relation between procrastination and asset allocation or 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. Other authors (e.g., Beshears, Choi, Laibson, and Madrian (2008)) have already hypothesized that present-biased preferences and the tendency to procrastinate might drive, at least in part, default effects. Consistent with this hypothesis, we find that procrastinators are significantly more likely to stick with the default investment portfolio. If instead an endorsement effect was a major driver of default effects, we would expect all employees—not only procrastinators—to exhibit preferences toward the newly elected default fund.

B. Framing of Retirement Benefits in DB vs. Cash Balance Plans

In this section, we follow a similar approach investigating retirement choices across defined benefits and cash balance plans. We build upon the insights of Brown, Kling, Mullainathan, and Wrobel (2008) and Beshears, Choi, Laibson, Madrian, and Zeldes (2014) who find that

annuity demand is sensitive to whether the decision is framed as an investment or a consumption choice. This 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 vs. lump-sum choice is communicated, we can take advantage of the fact that roughly 61% of our employees are separating from traditional DB plans that report benefits to employees in the form monthly retirement income. The other 39% of employees worked in cash balance plans which, although legally DB plans, communicate the benefits to employees in a more investment-oriented manner, such as reporting account balances and total accumulated retirement wealth.

We hypothesize that making the lump sum less salient in DB plans should work as a bias-counteracting treatment and mitigate the effect of procrastination on timing of retirement and annuitization. We estimate an equation similar to one in the previous section. Our coefficient of interest is now the interaction between the tendency to procrastinate and being enrolled in a traditional DB plan. As previously discussed, our estimate of this interaction term could still be unbiased if our treatment (i.e., being enrolled in a DB plan as opposed to a cash balance plan) is jointly independent from the tendency to procrastinate and potential omitted variables. Cash balance plans are legally classified as defined benefit plans and the benefits are computed following the same rules used for traditional DB plans. Few employees are aware of the technical differences between DB and cash balance plans and, hence, self-selection into these two different retirement plans is likely not substantial. Nonetheless, firms can also choose endogenously their retirement plan types based on their employees characteristics. Therefore, we cannot exclude that employees in these two types of plans are different along some unobservable—to us—dimensions that could correlated with the tendency to procrastinate. With this caveat in mind, we still believe that investigating the

effects of framing on the timing of retirement and annuitization is a worthy effort, especially considering the current policy debate about presenting benefits as retirement income also in DC plans.[7]

In table VIII, we find evidence consistent with our hypotheses. In columns (1) to (3) we investigate the effects of framing on the timing of separation. Procrastinators enrolled in defined benefit plans are less likely to retire earlier compared to procrastinators in cash balance plans. The effects are economically and statistically significant for two of the three procrastination measures.

In columns (4) through (6), we analyze the decision to choose an annuity or a lump sum as a payout. We find that procrastinators in defined benefit plans, where the lump-sum option is less salient, are significantly more likely to annuitize. All the coefficients are statistically and economically significant, with the negative effect of procrastination on annuitization being largely offset in DB plans. Altogether these results seem to suggest that a policy that promotes the framing of benefits as retirement income—as typical in DB plans, but not in DC plans—can potentially promote later retirements and higher annuitization demand.

V. Additional Evidence on Present-Biased Preferences as the Leading Explanation

Given the results in Section IV.A and IV.B of a more causal role of the tendency to procrastinate on retirement-related behaviors, we now turn our attention to understand what drives this tendency to procrastinate. While our results are overall consistent with procras-

[7]The Lifetime Income Disclosure Act would require private sector retirement plans, such as 401(k), to include on their statements estimates of participants' monthly benefits. The bill was introduced in the U.S. House in April 2019.

tination reflecting present-biased preferences, we address a comprehensive list of alternative explanations that could also be consistent with (some of) our findings.

Employees submitting their health care elections on the deadline day might rationally decide to do so. In other words, our empirical measure of procrastination could potentially capture non-procrastinators, but optimizers that rationally wait until the last day available to make their decisions. Analogously, individuals could procrastinate for several reasons and not necessarily just because they have present-biased preferences. For example, employees could simply lack the financial knowledge needed to make health care and retirement plan financial decisions. Or employees might face liquidity constraints that make it difficult to spare time to choose health care elections. Alternatively, employees could just be too busy, disorganized or rationally inattentive. In this section we provide evidence to help address all the above alternative explanations.

A. Ruling Out Alternative Hypotheses: Optimal Delay

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 IX, we examine this possibility 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 four 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, Table A.3.

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 III. The interaction effect is -32, 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 $+0.42$. In columns 3 and 4, procrastinators retire earlier and are less likely to annuitize. Again, these effects are largely offset for optimal delayers.

Overall, this evidence suggests that employees that rationally optimize their timing of healthcare elections have behaviors that are very different from those of procrastinators: they join earlier and save more in defined contribution plans. They also appear to retire

later and to be more likely to select an annuity. It is worth noting that our measure of procrastination include those employees that login for the first time and make their health-care elections on the deadline date. Nonetheless, we cannot exclude that some employees that we classify as procrastinators are optimally waiting till the deadline without engaging with the healthcare benefits online system earlier. The evidence in this section suggests that this misclassification—if anything—is likely to bias downward our estimated effect of procrastination.

B. Ruling Out Alternative Hypotheses: Low Financial Sophistication

Employees could procrastinate their health care elections because they lack basic financial knowledge. For the same reason, they could appreciate less the benefits or the need to save for retirement. Hence, they could be more reluctant to enrol in DC plans and, when enrolled, decide to save less or stick with the default asset allocation. For example, Lusardi and Mitchell (2007) find that financial literacy is positively correlated with the propensity to plan for retirement. To address the potential concern that financial literacy could explain some of our results, we repeat our analyses for those employees that in their 401k plans elect asset classes that are indicative of some basic financial knowledge. Instead of using the standard survey measures of financial literacy—not available for our sample of employees—we hypothesize that employees that allocate their retirement in more sophisticated asset classes are indeed more financially sophisticated. This approach is consistent with Calvet, Campbell, and Sodini (2009) that construct a measure of financial sophistication using actual portfolio choices.[8] In table X, column(1) and (2) we analyze the delay in joining the

[8]Our results on the effect of procrastination are robust to the inclusion of a standard survey measure of financial education at the zip code level from FINRA Foundation. We report this evidence in Table XI panel B.

defined contribution plan and contribution rates for those employees that allocate some of their retirement wealth to small cap stocks. Consistent with our previous results for the entire sample of DC employees, procrastinators take 56.3 more days to enrol in the plan and, conditional on joining, they save 0.96% less of their annual income. In Columns (3) to (6) we find similar results for employees that invest any of their retirement wealth in international equity or emerging markets. Although aware of the small cap premium (Fama and French 1992) or beware of the home bias (French and Poterba 1991), these employees with the tendency to procrastinate still make worse saving decisions.[9] We can build a proxy of financial sophistication only for employees enrolled in defined contribution plans. For employees in defined benefit plans we can only observe their payout choices and not any asset allocation. We believe this limitation of our data is less important for the DB sample. In fact, procrastination due to low financial sophistication could be consistent with our DC results, but could not fully explain our DB results. In other words, while low financial sophistication employees could decide to retire earlier because not aware of the benefits to work longer, it is not obvious while these employees would prefer lump sums to annuities. If anything, low sophistication employees would avoid the complexity associated with managing their lump sum, deciding how to invest it and how much to withdraw.

C. 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

[9] In untabulated analyses, we find similar results also for those employees that invest any of their retirement wealth in the specialty and self-directed windows (e.g., individual stocks). We do not report this evidence because investing in individual stocks could capture higher financial sophistication or familiarity bias towards own or other companies (Benartzi and Thaler 2007).

hence be more likely to be assigned to default options). Moreover, when enrolled they could be willing to save less. Last, they could decide to retire earlier and to choose a 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. Second, our evidence from quantile regressions that the effect of procrastination becomes about two 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 131,746 employees in DC plans (or 87% of our sample), we have information on their salary. This allows us to test if employees with lower income (and more likely to be liquidity constrained) drive our procrastination results. Therefore, in Table XI panel A, we replicate our baseline specifications adding interaction terms between our *Procrastination Ever* measure and indicator variables for income quartiles. We find similar results (unreported) for the other procrastination measures.

In column (1), we find that the effect of procrastination on the delay in joining is statistically significant across all the income quartiles. Even in the top income quartile, procrastinators take 49 more days to join the plan. 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 enrol in the retirement plan in the first place. For both measures of allocation to QDIA options in columns (3) and (4), we also find that the results appear

stronger for employees in the top quartile. Taken altogether this evidence suggests that low-income employees do not drive our procrastination results in DC plans. In the Online Appendix, table A.4 we present similar evidence from DB plans. The effect of procrastination is not limited to the low-income employees.

We complement this analysis, using FINRA Foundation's zip-code data on financial education and liquidity constraints. 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 (Lusardi and Mitchell (2007)). We also construct an index that proxies for liquidity constraints and takes values between one (low) and five (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. In Table XI, panel B, we report that financial education is associated—as expected—with lower delay in joining, higher saving rates and lower investments in the default options. Our proxy for liquidity constraints 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.

Procrastination can influence retirement-related financial behaviors 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. In the Online Appendix, table A.5, we use mediation

analysis to account systematically for this possibility.[10] We find that while indirect effects are statistically significant, most of the influence of procrastination is direct and not mediated through income. Direct effects indeed account for three quarters of total effect.

D. 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 job (and assuming a job change every 10 years), a contribution rate reduced by 0.5% to 0.7%, and a reduction in annuitization by five to six percentage points (assuming that annuitization increases one's consumption possibilities by 30%, the lower end of the values found in Mitchell, Poterba, Warshawsky, and Brown (1999)). Assuming an individual enters the workforce at age 22 and exits at 62, with retirement nine to 12 months earlier for a procrastinator, we find that, all else equal, procrastination reduces the consumption financed by the retirement plan by about 15 to 20% relative to otherwise identical individuals that do not procrastinate. This assumes that procrastinators and non-

[10] 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.

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. A 15% reduction in post-retirement consumption is difficult to rationalize via a rational inattention story.

E. 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 IV). 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 retirement results. If people procrastinate because they are simply disorganized or very busy, there is no obvious reason that this should be correlated with when to retire or whether to take the money as a lump sum or annuity. When a person retires, they must communicate to the H.R. department their decision and fill-in all the relevant paperwork. They also have to choose how to access their

retirement money: unlike the decision 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 timing of retirement and annuity demand. Present-biased individuals would prefer to anticipate leisure time to work. Analogously, 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 Tables V and VI.

Overall, the evidence in section V supports our hypothesis that the tendency to procrastinate largely capture present-biased preferences, and thus that present-bias is a fundamental contributor to understanding the large variation in retirement preparedness and annuitization rates after retirement.

F. Out-of-sample Replication Test and 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 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 XII, 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 XII, 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. None of these variables are statistically significant in our analysis. [11]

[11] 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.

VI. Conclusions

Of all the individual behaviors that influence retirement income security, two of the most important are whether or not individuals save adequately and whether or not they annuitize their resources upon retirement. We know from a long line of research that many individuals do not save adequately (e.g., Benartzi and Thaler (2007)) and that few individuals voluntarily annuitize, either by delaying Social Security or by purchasing annuities in the private market (e.g., Benartzi, Previtero, and Thaler (2011)). Although these behaviors are correlated with a range of socio-economic factors, much of the cross-sectional variation is difficult to explain. In this paper we investigate if the tendency to procrastinate—as stemming by present-biased preferences—could help to understand this variation.

Using a new empirical measure of procrastination on benefit elections, we present evidence that procrastinators behave differently from non-procrastinators in virtually every major step of financial planning for retirement. Specifically, in saving for retirement procrastinators are less likely to participate in (supplementary) savings plans, take longer to sign up when they do participate, contribute less to their DC plans, and tend to stick with default investment options. In the decumulation phase, procrastinators tend to retire earlier and are less likely to annuitize, especially when the decision is framed in an investment-oriented setting (such as in cash balance plans). These results are robust to various definitions of procrastination, to a set of control variables, and across three different data sets covering a range of employers. Our results are consistent with the leading view in economics that models procrastination as a manifestation of present-biased preferences. Although individuals may delay decision-making for other reasons, we discuss why these alternative hypotheses are unlikely explanations for the full set of our findings.

Our findings have wide-ranging implications. At an intellectual level, our results provide a direct and robust evidence 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. Last, procrastinators tend to favor retiring earlier or choosing lump sum payments and these tendencies are weakened when benefits are presented in term of retirement income (instead of retirement wealth as common practice in most 401k plans). 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, increasing the salience of future payoffs, or presenting benefits as retirement income. This should help guide future research on the relative efficacy of alternative plan design interventions aimed at promoting saving for retirement, delaying retirement, or annuitization.

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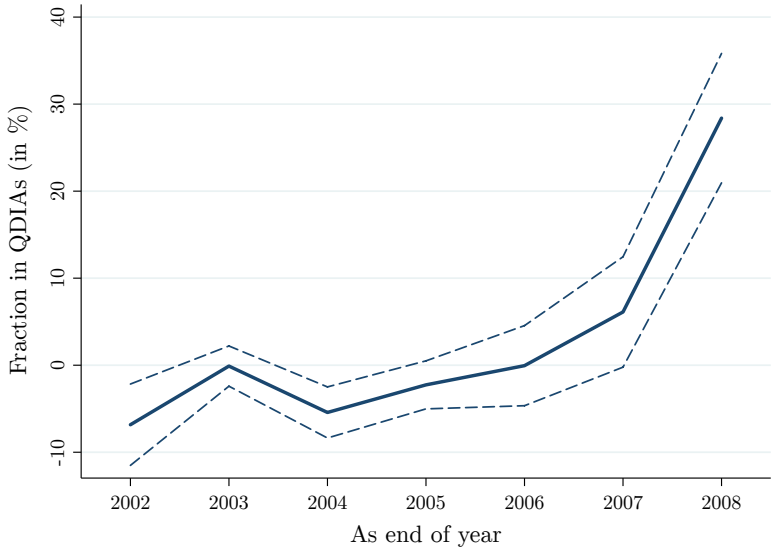
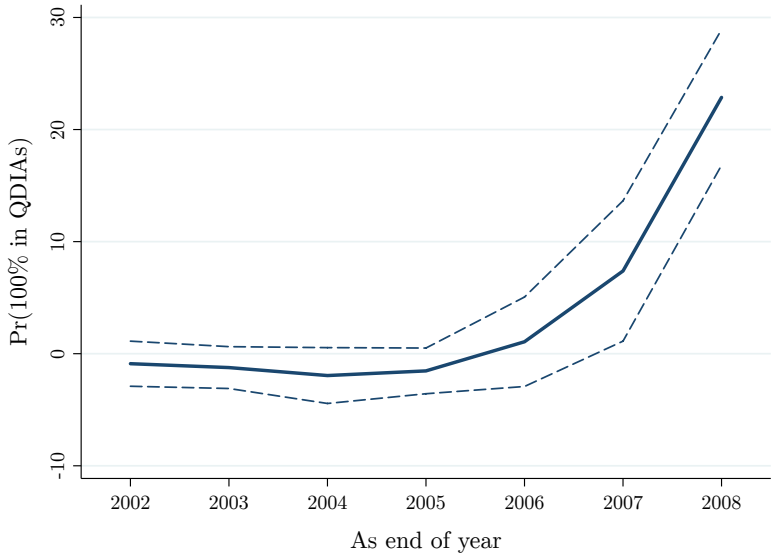
Figure I. Time Trend in Asset Allocations Around the PPA

These figures plot the coefficient estimates for the interaction terms following equation 2, where the dependent variables are the faction invested in qualified default investment alternatives (QDIAs) for panel (a) and the probability of having 100% of retirement savings invested in QDIAs for panel (b). The coefficient estimate at end of year t represents the difference in the outcome variables between procrastinators and non procrastinators. The estimation period goes from six year before the pension protection act (PPA) to one year after (i.e., year-end 2008). The dotted lines show the 90% confidence interval.



(a) Time trend of the fraction of savings allocated to QDIAs



(b) Time trend of the probability of allocating 100% to QDIAs

Table I. Summary Statistics of Socioeconomic Characteristics

Table I Panel A provides summary statistics for socioeconomic characteristics for the employees enrolled in defined contribution plans. Table I 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.

Panel A: Defined Contribution (DC) Plans

	All DC Employees (N = 154,870)		Procrastinators **[A]** (N = 5,308)		Non-Procrastinators **[B]** (N = 149,562)		Difference **[A - B]**	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Est.	t-value
Female(%)	43.74	49.61	44.67	49.72	43.71	49.60	0.96	1.39
Age at Hire	35.09	10.28	34.03	9.85	35.12	10.30	-1.10	-7.63
Salary	57,460	47,180	57,080	43,604	57,473	47,302	-392.95	-0.60
Nr. Health Elections	2.40	1.50	1.16	0.45	2.45	1.50	-1.29	-62.57
Nr. Submissions	1.37	0.69	1.00	0.00	1.38	0.70	-0.38	-40.23
Size of Firm	70,698	46,835	71,797	59,334	70,659	46,329	1,138	1.74
Days to Enroll	206.31	396.98	276.43	446.38	203.83	394.88	72.60	13.10
Saving Rate (%)	7.20	4.32	6.82	4.19	7.22	4.33	-0.39	-6.49
Share in QDIA fund (%)	23.17	37.18	34.75	42.38	22.76	36.91	11.99	22.83
Pr(100% QDIA) (%)	13.12	33.76	21.69	41.22	12.82	33.43	8.87	18.58
Procr. First (%)	7.33	26.07	-	-	-	-	-	-
Procr. Ever (%)	12.53	33.10	-	-	-	-	-	-
Procr. Always (%)	3.43	18.19	1	-	0	-	-	-

Panel B: Defined Benefit (DB) Plans

	All DB Employees (N = 26,864)		Procrastinators **[A]** (N = 360)		Non-Procrastinators **[B]** (N = 26,504)		Difference **[A - B]**	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Est.	t-value
Female (%)	46.56	49.88	39.44	48.94	46.65	49.89	-7.21	-2.72
Benefits Amount	269,489	357,551	288,058	354,459	269,237	357,593	18,821	0.99
Salary	23,114	48,621	21,711	38,194	23,133	48,748	-1,422	-0.55
Nr. Elections	2.74	1.74	1.15	0.47	2.76	1.74	-1.61	-17.53
Nr. Submissions	1.47	0.88	1.00	0.00	1.48	0.88	-0.48	-10.31
Cash Balance Plan (%)	39.23	48.83	51.11	50.06	39.07	48.79	12.05	4.65
Age at Separation	59.70	4.86	58.11	4.43	59.72	4.86	-1.61	-6.24
Annuity (%)	42.22	49.39	36.39	48.18	42.30	49.40	-5.91	-2.26
Procr. First (%)	4.10	19.83	-	-	-	-	-	-
Procr. Ever (%)	8.38	27.71	-	-	-	-	-	-
Procr. Always (%)	1.34	11.50	1	-	0	-	-	-

Table II. Who Procrastinates?

Table II reports results from regressions of the probability of being a procrastinator on socioeconomic characteristics, having been a procrastinator in the last health care election, and retirement plan fixed effects. All the coefficients are scaled and represent the effects in percentage points. Salary is standardized and the coefficients can be interpreted as the effect of one standard deviation variation in salary. For the sample of DC plans, age represents the effect of an increase of five years in enrollment age. For the sample of DB plans, age represent the effect of an increase of one year in retirement age. In Columns 1-3, we report results for all the employees enrolled in 2008. In Columns 4 and 5, we limit our analyses to employees enrolled respectively in plans without or with default options. In Columns 9 and 10, we limit our analyses to employees separating respectively from traditional DB plans or cash balance 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 $p < 0.01$.

Dependent Variable:	Pr(Procrastinator)							
Sample:	Defined Contribution Plans				Defined Benefit Plans			
			w/out Default Options	with Default Options			Traditonal DB Plans	Cash Balance Plans
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Past Procrastinator		12.131***	12.147***	11.841***		8.519***	9.458***	7.353***
		(1.564)	(1.659)	(1.043)		(1.935)	(2.656)	(2.443)
Female	-0.044	-0.308*	-0.344**	0.389	-0.231	0.324	0.444*	0.162
	(0.197)	(0.152)	(0.157)	(0.208)	(0.218)	(0.228)	(0.228)	(0.349)
Age	-0.097***	-0.108***	-0.099***	-0.249***	-0.089***	-0.063**	-0.021	-0.107***
	(0.028)	(0.029)	(0.030)	(0.065)	(0.021)	(0.027)	(0.050)	(0.036)
Salary (Std)	0.449***	0.363***	0.355***	0.553	0.094	0.105	0.316	0.017
	(0.125)	(0.097)	(0.098)	(0.305)	(0.160)	(0.164)	(0.278)	(0.130)
Nr. Health Elections	-1.399***	-1.301***	-1.292***	-1.509***	-0.534***	-0.490***	-0.409***	-0.578*
	(0.237)	(0.228)	(0.243)	(0.213)	(0.152)	(0.128)	(0.141)	(0.283)
Benefits Amount					0.004	0.005	0.010	-0.002
					(0.003)	(0.004)	(0.007)	(0.004)
Size Firm	2.282***	1.825***	1.852***	1.566***				
	(0.047)	(0.057)	(0.059)	(0.057)				
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes		Yes
N	369,861	196,582	186,738	9,844	73,559	38,395	20,282	18,113
R-sq	0.039	0.057	0.059	0.034	0.102	0.032		0.032

Table III. Procrastination and Delay in Joining

Table III reports results from regressions of the delay in joining the defined contribution plan on our three different measures of procrastination, demographic controls and fixed effects 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. Constant is included in Columns 1-3. Statistical significance is denoted as follows: if $p < 0.10$; ** if $p < 0.05$; *** if $p < 0.01$.

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	49.744***			0.843***		
	(12.757)			(0.026)		
Procr. Ever		62.105***			0.816***	
		(11.487)			(0.023)	
Procr. Always			60.036**			0.822***
			(22.348)			(0.044)
Female	0.833	0.995	1.023	0.969*	0.968*	0.969*
	(5.463)	(5.476)	(5.434)	(0.016)	(0.017)	(0.016)
Age at Hiring	-9.286***	-9.171***	-9.300***	1.041***	1.041***	1.041***
	(1.425)	(1.419)	(1.429)	(0.006)	(0.006)	(0.006)
Salary (Std)	-21.035***	-21.484***	-20.903***	1.072***	1.073***	1.072***
	(6.865)	(6.836)	(6.886)	(0.012)	(0.012)	(0.013)
Nr. Health Elections	73.031***	71.782***	73.767***	0.832***	0.837***	0.830***
	(11.565)	(11.215)	(11.789)	(0.028)	(0.027)	(0.028)
Size Firm (log)	-0.183	-1.431	-0.147	1.099***	1.097***	1.099***
	(4.074)	(3.989)	(4.011)	(0.036)	(0.036)	(0.035)
Plan F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N	151,820	151,820	151,820	151,293	151,293	151,293
R-sq	0.311	0.313	0.311			

Table IV. Procrastination and Saving Rates

Table IV Panel A 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 retirement plan fixed effects. 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 analyses to employees enrolled in DC plan with no default options; in Columns 7-9, we analyze employees from plans with default options. Panel B 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 retirement plan fixed effects. 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 joining in 2008. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Constant is included. Statistical significance is denoted as follows: * if $p < 0.10$; ** if $p < 0.05$; *** if $p < 0.01$.

Panel A: Procrastination and Saving Rates

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	-0.441**			-0.541*			-0.100		
	(0.212)			(0.258)			(0.266)		
Procr. Ever		-0.464*			-0.558*			-0.073	
		(0.231)			(0.287)			(0.220)	
Procr. Always			-0.585*			-0.747*			-0.120
			(0.314)			(0.404)			(0.295)
Female	-0.197	-0.198	-0.198	-0.245	-0.246	-0.246	-0.130	-0.130	-0.130
	(0.153)	(0.153)	(0.153)	(0.151)	(0.152)	(0.152)	(0.331)	(0.331)	(0.331)
Age at Hiring	0.132***	0.132***	0.132***	0.119**	0.120**	0.120**	0.161***	0.161***	0.161***
	(0.037)	(0.037)	(0.037)	(0.049)	(0.050)	(0.049)	(0.041)	(0.041)	(0.041)
Salary (Std)	0.721***	0.721***	0.721***	0.590***	0.590***	0.590***	0.931***	0.931***	0.931***
	(0.122)	(0.122)	(0.122)	(0.116)	(0.116)	(0.116)	(0.100)	(0.099)	(0.100)
Nr. Health Elections	-0.213***	-0.187***	-0.230***	-0.227**	-0.192**	-0.249**	-0.162	-0.160	-0.165
	(0.070)	(0.060)	(0.079)	(0.082)	(0.069)	(0.096)	(0.098)	(0.098)	(0.098)
Size Firm (log)	0.042**	0.045**	0.048**	0.490***	0.490***	0.479***	0.059**	0.058***	0.060**
	(0.018)	(0.019)	(0.018)	(0.147)	(0.148)	(0.147)	(0.017)	(0.016)	(0.018)
Plan F. E.	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	0.104	0.104	0.104	0.112	0.113	0.112	0.057	0.057	0.057

Table IV. — *Continued*

Panel B: Quantile Regressions of Saving Rates

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	-0.335***			-0.115***			-0.417***			-0.636***		
	(0.032)			(0.023)			(0.102)			(0.169)		
Procr. Ever		-0.329***			-0.142***			-0.430***			-0.715***	
		(0.028)			(0.026)			(0.073)			(0.147)	
Procr. Always			-0.434***			-0.142***			-0.449***			-0.717***
			(0.054)			(0.029)			(0.132)			(0.118)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table V. Procrastination and Timing of Retirement

Table V reports results from regressions of the age when an employee starts claiming benefits on our measures of procrastination, demographic controls, and fixed effects for retirement plans and retirement years. In Columns 1-3, we report results for all the employees enrolled in defined benefit plans. In Columns 4-6, we limit our analyses to employees that are age 55 and above when claiming benefits; in Columns 7-9, we analyze employees that are age 60 and above. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Constant is included. Statistical significance is denoted as follows: * if $p < 0.10$; ** if $p < 0.05$; *** if $p < 0.01$.

Dependent Variable:	Age When Claiming Benefits								
Sample:	All Ages			Age >55			Age >60		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Procr. First	-0.671***			-0.539***			-0.336*		
	(0.166)			(0.170)			(0.185)		
Procr. Ever		-0.433***			-0.315***			-0.113	
		(0.124)			(0.111)			(0.110)	
Procr. Always			-1.131***			-0.948***			-0.792***
			(0.268)			(0.240)			(0.242)
Female	-0.867*	-0.863*	-0.866*	-0.486*	-0.482*	-0.484*	-0.240	-0.238	-0.238
	(0.433)	(0.432)	(0.433)	(0.256)	(0.256)	(0.256)	(0.169)	(0.170)	(0.169)
Benfits Amount	0.002	0.002	0.002	-0.006*	-0.006*	-0.006*	-0.007***	-0.007***	-0.007***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Salary (Std)	-0.361**	-0.360**	-0.362**	-0.253	-0.252	-0.252	-0.193	-0.194	-0.194
	(0.159)	(0.160)	(0.160)	(0.152)	(0.152)	(0.153)	(0.136)	(0.136)	(0.136)
Nr. Health Elections	-0.088	-0.079	-0.095	-0.145	-0.139	-0.151	-0.291**	-0.288**	-0.295**
	(0.099)	(0.099)	(0.100)	(0.100)	(0.100)	(0.100)	(0.114)	(0.114)	(0.114)
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Retirement Year F. E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	26,864	26,864	26,864	23,348	23,348	23,348	13,391	13,391	13,391
R-sq	0.130	0.130	0.130	0.145	0.145	0.145	0.168	0.167	0.168

Table VI. Procrastination and Annuitization

Table VI reports results from regressions of an indicator variable equal to one if the employee chooses an annuity on our measures of procrastination, demographic controls, and fixed effects 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 analyses to employees that are age 55 and above when claiming benefits; in Columns 7-9, we analyze employees that are age 60 and above. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Constant is included. Statistical significance is denoted as follows: * if $p < 0.10$; ** if $p < 0.05$; *** if $p < 0.01$.

Dependent Variable:	Pr (Annuity)								
Sample:	All Ages			Age >55			Age >60		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Procr. First	-5.986***			-6.506***			-7.430**		
	(1.616)			(1.799)			(2.823)		
Procr. Ever		-3.900***			-3.903**			-3.377*	
		(1.363)			(1.462)			(1.926)	
Procr. Always			-4.514			-4.348			-4.414
			(2.901)			(3.258)			(5.426)
Female	3.608***	3.638***	3.630***	3.943***	3.981***	3.983***	4.288***	4.318***	4.320***
	(1.062)	(1.061)	(1.069)	(1.303)	(1.304)	(1.312)	(1.263)	(1.272)	(1.282)
Age at Separation	2.250***	2.252***	2.255***	1.883***	1.886***	1.889***	1.652**	1.658**	1.657**
	(0.418)	(0.418)	(0.418)	(0.479)	(0.479)	(0.479)	(0.662)	(0.665)	(0.664)
Benfits Amount	0.290***	0.290***	0.290***	0.281***	0.281***	0.281***	0.277***	0.277***	0.277***
	(0.063)	(0.063)	(0.063)	(0.061)	(0.062)	(0.061)	(0.048)	(0.048)	(0.048)
Salary (Std)	-2.136**	-2.127**	-2.146**	-2.130*	-2.112*	-2.122*	-1.502	-1.514	-1.523
	(0.961)	(0.960)	(0.968)	(1.164)	(1.164)	(1.169)	(1.115)	(1.126)	(1.125)
Nr. Health Elections	0.109	0.188	0.097	0.025	0.107	0.016	0.142	0.216	0.140
	(0.810)	(0.823)	(0.812)	(0.774)	(0.784)	(0.776)	(0.834)	(0.843)	(0.830)
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Retirement Year F. E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	26,864	26,864	26,864	23,348	23,348	23,348	13,391	13,391	13,391
R-sq	0.448	0.448	0.447	0.449	0.449	0.448	0.442	0.442	0.441

Table VII. Procrastination, Asset Allocation, and the Pension Protection Act

Table VII reports results from regressions of retirement asset allocation on our 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. Constant is included. Statistical significance is denoted as follows: * if $p < 0.10$; ** if $p < 0.05$; *** if $p < 0.01$.

Dependent Variable:	Fraction in QDIAs			Pr(100% in QDIAs)		
Sample Period:	2002-08			2002-08		
	(1)	(2)	(3)	(4)	(5)	(6)
Procr. First	1.300*			1.235		
	(0.693)			(0.757)		
Procr. First x post PPA	9.624***			5.473***		
	(1.891)			(1.915)		
Procr. Ever		0.404			0.408	
		(0.718)			(0.765)	
Procr. Ever x post PPA		10.916***			3.312	
		(2.804)			(2.130)	
Procr. Always			1.822			1.755
			(1.377)			(1.543)
Procr. Always x post PPA			9.976***			8.132***
			(2.657)			(2.544)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year F. E.	Yes	Yes	Yes	Yes	Yes	Yes
N	149,258	149,258	149,258	149,258	149,258	149,258
R-sq	0.380	0.380	0.379	0.271	0.270	0.271

Table VIII. Procrastination, Annuitization, and Framing

Table VIII reports results from regressions of retirement decisions on our measures of procrastination, demographic controls and fixed effects for retirement plans and years of enrollment. *DB plan* is an indicator variable equal to one if the employee is enrolled in a traditional defined benefit plan as opposed to a cash balance plan. More details on the differences between these two plan types are in the text. In Columns 1-3, we report results for the age when an employee starts claiming benefits. In Columns 4-6, the outcome variable is the probability of choosing an annuity and all the coefficients are scaled and represent the effects on annuitization in percentage points. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Constant is included. Statistical significance is denoted as follows: * if $p < 0.10$; ** if $p < 0.05$; *** if $p < 0.01$.

Dependent Variable:	Age When Claiming Benefits			Pr (Annuity)		
	(1)	(2)	(3)	(4)	(5)	(6)
Procr. First	-0.879***			-8.619***		
	(0.192)			(2.457)		
Procr. First x DB plan	0.481*			6.067*		
	(0.268)			(3.435)		
Procr. Ever		-0.851***			-7.300***	
		(0.191)			(1.953)	
Procr. Ever x DB plan		0.754***			6.127**	
		(0.236)			(2.795)	
Procr. Always			-1.172***			-12.662***
			(0.320)			(2.747)
Procr. Always x DB plan			0.084			16.514***
			(0.482)			(4.723)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes
Retirement Year F. E.	Yes	Yes	Yes	Yes	Yes	Yes
N	26,864	26,864	26,864	26,864	26,864	26,864
R-sq	0.130	0.130	0.130	0.448	0.448	0.448

Table IX. Procrastinators vs. Optimal Delayers

Table IX 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 ad 4, all the coefficients are scaled and represent the effects on the outcome variable in percentage points. In Columns 1 and 2, we report results for employees enrolled in defined contribution plans. In Columns 3 and 4, 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. Constant is included. Statistical significance is denoted as follows: * if $p < 0.10$; ** if $p < 0.05$; *** if $p < 0.01$.

Sample:	Defined Contribution Plans		Defined Benefit Plans	
Dependent Variable	Days to Join	Saving Rate	Age of Claiming	Pr (Annuity)
	(1)	(2)	(3)	(4)
On Deadline	64.800***	-0.470*	-0.607***	-4.405**
	(13.797)	(0.255)	(0.146)	(1.648)
On Deadline x I (Subm. >1)	-32.200**	0.419**	0.539**	2.437*
	(13.458)	(0.165)	(0.206)	(1.444)
I (Submission>1)	-5.780	0.044	-0.331**	-0.762
	(5.121)	(0.062)	(0.127)	(0.635)
Demographic Controls	Yes	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes	Yes
Year F. E.	Yes	No	Yes	Yes
N	151,820	27,016	26,864	26,864
R-sq	0.313	0.104	0.131	0.448

Table X. Procrastination and Financial Sophistication

Table X reports results from regressions of the delay in joining the defined contribution plan and the saving rate (as a fraction of total annual income) on our measure *Procrastination Ever*, demographic controls and fixed effects for retirement plans and enrollment years. In Columns 2, 4, and 6 all the coefficients are scaled and represent the effects on the outcome variable in percentage points. In Columns 1 and 2, we report results for employees that have any retirement money invested in small cap stocks or funds. In Columns 3 and 4, we investigate employees with investments in international equity. In Columns 5 and 6, we provide evidence for employees with investments in emerging market equity. N provides the number of observations used in each estimation. Standard errors in parentheses are clustered at the plan level. Constant is included. Statistical significance is denoted as follows: * if $p < 0.10$; ** if $p < 0.05$; *** if $p < 0.01$.

Financial Sophistication as any $ in:	Small Caps		International Equity		Emerging Markets	
Dependent Variable:	Days to Join	Saving Rate	Days to Join	Saving Rate	Days to Join	Saving Rate
	(1)	(2)	(3)	(4)	(5)	(6)
Procr. Ever	56.266***	-0.964***	60.658***	-0.697***	70.098***	-1.016**
	(7.293)	(0.338)	(9.923)	(0.211)	(13.513)	(0.410)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year F. E.	Yes	No	Yes	Yes	Yes	Yes
N	59,121	6,540	66,786	8,012	24,484	3,709
R-sq	0.224	0.104	0.241	0.100	0.200	0.074

Table XI. Procrastination and Liquidity Constraints

Table XI, Panel A 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 plan fixed effects and—in Column 1—year of enrollment fixed effects. In Columns 2 and 3, all the coefficients are scaled and represent the effects on the outcome variable in percentage points. Panel B reports results from regressions of similar retirement decisions with the inclusion of zip-level control variables. *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. In Columns 4 to 9, 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 $p < 0.01$.

Panel A: Procrastination, Income and Retirement Planning

Period:	2002-2008	2008	
Dependent Variable:	Days to Join	Saving Rate	% in QDIAs
	(1)	(2)	(3)
Procr. Ever X Income Q1	59.457***	-0.047	2.000**
	(13.970)	(0.033)	(0.726)
Procr. Ever X Income Q2	69.962***	-0.610***	4.015**
	(15.520)	(0.143)	(1.916)
Procr. Ever X Income Q3	71.739***	-0.905***	4.393**
	(20.313)	(0.185)	(1.584)
Procr. Ever X Income Q4	49.044***	-1.582***	9.159***
	(13.309)	(0.444)	(3.068)
Income Quartile Controls	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes
Enrollment Year F. E.	Yes	No	No
N	131,741	20,490	19,538
R-sq	0.339	0.133	0.467

Table XI. — *Continued*

Panel B: The effect of Financial Literacy and Financial Hardship

Period:	2002-08		2008		2008	
Dependent Variable	Days to Join		Saving Rate		% in QDIAs	
	(1)	(2)	(3)	(4)	(5)	(6)
Procr. Ever	62.105***	57.175***	-0.464*	-0.479*	3.375**	3.116
	(11.487)	(12.902)	(0.231)	(0.272)	(1.428)	(2.014)
Financial Literacy		-1.214		0.058**		-0.067
		(1.206)		(0.021)		(0.203)
Financial Hardship		2.848*		-0.100*		0.271*
		(1.512)		(0.055)		(0.133)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year F. E.	Yes	Yes	No	No	No	No
N	151,820	100,885	27,016	15,035	26,020	14,289
R-sq	0.313	0.342	0.104	0.117	0.508	0.519

Table XII. Evidence from the University of Illinois Supplemental Saving Plan

Table XII Panel A provides summary statistics for socioeconomic characteristics for the new UI employees eligible to enroll in the supplemental saving plan. Table XII 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 administrative 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 $p < 0.01$.

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)

Online Appendix for "Saving for Retirement, Annuities, and Procrastination"

by

Jeffrey R. Brown and Alessandro Previtero

I. Direct and Indirect Effects of Procrastination: Mediation Analysis

In the paper 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. 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 practice, following the seemingly unrelated regression model by Zellner (1962) and Zellner (1963), 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:

$$y_{ip} = \eta_1 + \lambda_1 Procrastination_{ip} + \alpha Income_{ip} + \Omega_1 BaselineControls_{ip} + \epsilon_{1ip} \quad (3)$$

$$Income_{ip} = \eta_2 + \lambda_2 Procrastination_{ip} + \Omega_2 BaselineControls_{ip} + \epsilon_{2ip} \quad (4)$$

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. (3). We obtain the indirect effect as the product $\lambda_2\alpha$, that is by multiplying the effect of Income from Eq. (3) with the estimates of the Procrastination on Income in Eq. (4).

In Table A.5, we introduce the results of the mediation analysis. 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. Our results are robust to the use of bootstrapping methods (Preacher (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).

The evidence from Table A.5 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.

Table A.1. Procrastination and Saving Rates (Employees joining in 2002-2008)

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 fixed effects 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 analyses 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. Constant is included. 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 $p < 0.01$.

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)
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year F. E.	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.2. Procrastination and Asset Allocation (Placebo Test)

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 $p < 0.01$.

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)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Year F. E.	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.3. Procrastinators vs. Optimal Delayers (Robustness Checks)

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 her 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 $p < 0.01$.

Panel A: First-time Procrastinators

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 F. E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F. E.	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: Always Procrastinators

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 F. E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F. E.	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.4. Procrastination, Income and Retirement-related decisions (DB plans)

Table A.4 reports results from regressions of the retirement decisions in DB plans on our measure *Procrastination Ever* interacted with the different income quartiles. Additional controls include: demographic variables; indicator variables for income quartiles, and fixed effects for retirement plans and retirement years. 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 $p < 0.01$.

Sample:	DB plans	Cash Balance Plans	DB plans	Cash Balance Plans
Dependent Variable:	Age of Claiming		Pr (Annuity)	
	(1)	(2)	(3)	(4)
Procr. Ever X Income Q1	-0.902	-1.685	-2.615	0.427
	(0.549)	(1.413)	(5.759)	(3.734)
Procr. Ever X Income Q2	-0.646**	-0.586	-5.532*	-1.597
	(0.298)	(0.349)	(2.741)	(1.930)
Procr. Ever X Income Q3	-0.499***	-0.598***	-7.647***	-8.293***
	(0.149)	(0.196)	(1.893)	(2.372)
Procr. Ever X Income Q4	-0.334	-0.604***	2.089	0.781
	(0.234)	(0.166)	(1.918)	(2.281)
Income Quartile Controls	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
Plan F. E.	Yes	Yes	Yes	Yes
Year of Retirement F. E.	Yes	No	Yes	No
N	131,741	20,490	131,741	20,490
R-sq	0.339	0.133	0.339	0.133

Table A.5. Procrastination and Income: Mediation Analysis

Table A.5 reports results from seemingly unrelated regressions of the retirement decisions in DC plans on our three measures of procrastination. Additional controls include: demographic variables; fixed effects for retirement plans and—for the *Days to Join* outcome variable—fixed effects for 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 in the Internet Appendix. 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 $p < 0.01$.

	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%]		