

The Evolution of U.S. Firms' Retirement Plan Offerings: Evidence from a New Panel Data Set¹

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Abstract

This paper documents, using a newly-constructed data set, the evolution of the characteristics of employer-sponsored DC schemes. The features we focus on are their match schedules, vesting schedules, and the extent of 'auto-features' (i.e. presence of auto-enrollment, the level of any default contribution, and presence and details of auto-escalation). The data we construct is formed by hand-coding the details in narrative plan descriptions attached to plan filings. Our data covers approximately 5,000 plans, covering up to 37 million participants annually, for the period 2003-2017. We document that matching schedules, when they are offered, have become more generous over time. However, the proportion of firms offering a match fell sharply during the Great Recession and the proportion offering one did not recover to its pre-financial crisis level for almost a decade. Vesting schedules for DC plans have remained essentially unchanged since 2003, while the proportion of plans with auto-enrollment has increased dramatically over the same period. We find that the vast majority of plans that offer auto-enrollment have a default rate that is substantially lower than the level that would fully exploit the match offered by the employers.

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Executive Summary

Almost two thirds of private-sector workers in the US have access to an employer-sponsored Defined Contribution (DC) plan, and every year employers and employees contribute around \$500 billion to these accounts. The features and generosity of DC plans can vary greatly across firms.

This paper documents, using a newly-constructed data set, the evolution of the characteristics of employer-sponsored DC schemes. The features we focus on are their match schedules, rules on vesting, and the extent of ‘auto-features’ (i.e. presence of auto-enrollment, the level of any default contribution, and presence and details of auto-escalation). The data we construct is formed by hand-coding the details in narrative plan descriptions attached to plan filings. Our data covers approximately 5,000 plans, covering up to 37 million participants annually, for the period 2003-2017.

We find:

- Matching schedules, when offered, have become more generous over time. The combined contribution (employee and employer) of someone fully exploiting their match increased by close to 1% of salary between 2003-2017.
- Safe-harbor regulations play an important role in plan design. By 2017, over 40% of our sample of large plans satisfy one of the safe-harbor plan conditions, with around half of these satisfying them at the minimum requirements.
- The Great Recession cast a long shadow on the employer-sponsored DC landscape. The proportion of firms in our sample of the largest plans that offer a match did not recover to its pre-financial crisis level for almost a decade.
- Vesting horizons have not changed substantially over the period we consider - employer contributions vest only very slightly sooner than they did in 2003.
- We document the large increase in prevalence of auto-enrollment over the past two decades. Among the sample of the largest plans, about 41.1% of firms auto-enrolled their members in 2017, up from 2.4% in 2003.
- The prevalence of auto-enrollment plus auto-escalation has also been increasing from being virtually non-existent to 17.8% over the period 2003 to 2017 in our sample of large plans.
- The vast majority of plans that offer auto-enrollment have a default rate that is substantially lower than the level that would fully exploit the match offered by the employer. Only a third of our sample of large plans default members at the maximum level to fully exploit the match.

1. Introduction

Sixty-four percent of private-sector workers in the US have access to an employer-sponsored Defined Contribution (DC) plan and, every year, employers and employees contribute around \$500 billion to these accounts (Myers & Topoleski, 2020; Department of Labor, 2021). While the availability of DC plans is now widespread, their features and generosity can vary greatly across firms. Employers may choose to match employee contributions up to some threshold, and require minimum tenure lengths before employer contributions are vested. They can also choose to automatically enroll and escalate their employees' contributions in these plans. Documenting the characteristics of DC plans and their evolution over time is therefore critical to predicting the state of retirement preparedness in the US. With more American workers entering retirement with no Defined Benefit accruals (Wiatrowski 2011, Butrica & Smith 2012), retirees will have to rely increasingly on DC wealth to supplement Social Security and maintain living standards into and through retirement.

This paper documents, using a newly-constructed data set, the evolution of characteristics of employer-sponsored DC schemes - the generosity of match schedules, rules on vesting, and the extent of 'auto-features' (Appendix B defines and gives more details on each of these features). We show how those features have evolved since 2003 for a sample that includes a majority of US workers in DC schemes and pay particular attention to suspensions of employer contributions that were seen during the Great Recession (Munnell & Quinby (2010), Dushi et al. (2013)). The economic turbulence brought on by the Covid-19 pandemic has caused a new wave of suspensions (Center for Retirement Research 2021).

These features, and the design of retirement plans more generally, impact the volume of household retirement savings. Accrued balances serve as an important complement to Social Security, especially for middle-income individuals who receive lower replacement rates from Social Security than lower-income individuals. Trends in such design features, therefore, will have a critical impact on resources of future generations of retirees, and their living standards throughout retirement. Retirement wealth can bear heavily on both Labor Force Participation Rate at older ages and Social Security claiming ages. As a result, understanding changes in plan features is crucial for understanding the likely labor supply behavior of future cohorts.

The data set that we construct in this paper leverages the fact that all employers with a retirement plan are obliged to submit an annual regulatory form: a Form 5500. For firms with more than 100 participants, an attachment to this form must be included which contains a narrative description of the retirement plan characteristics. These descriptions, typically three to five pages long, have been made publicly available by the Bureau of Labor, but in their original form (free-form text) they are not readily amenable to empirical analysis. The new data set that we have created involves codifying key features (matching, vesting and auto-features) for two different samples. The first contains the largest 4,200 DC retirement plans in the private and non profit sectors (401(k) and 403(b) plans). These very large firms cover a large number of employees - in 2017, 37 million employees were eligible to contribute to one of these large plans and, collectively, they accounted for 55% of the population of workers enrolled in private and non-profit sector Defined Contribution retirement plans. The

second contains a random sample of 1,086 plans, which allows us to investigate trends that are representative for the population of those who save in employer sponsored DC plans.

Analyzing this new data set, we find that:

Matching

- Matching schedules, when offered, have become more generous over time. The combined employee and employer contribution rate of an individual fully exploiting the match offered by their employer has increased, on average, by roughly 1% of salary between 2003 and 2017 (from 6.4% to 7.2% of salary in our sample of large plans, and from 6.5% to 7.5% of salary in our representative sample).
- While firms decide whether and how to offer matched contributions, we find that government regulations are often binding and play an important role in plan design. With regulations, policy-makers can (and do) incentivize the adoption of specific matching formulas, vesting schedules, or auto-features by granting a ‘safe-harbor’ status which exempts plans with certain characteristics from non-discrimination testing. By 2017, over 40% of our sample of large plans satisfy one of the safe-harbor plan conditions, with around half of these satisfying them at the minimum requirements.
- We document the extent of widely-discussed match suspensions during the Great Recession. We also document a fact which has not been widely-documented: these suspensions have cast a long shadow. The proportion of firms in our sample of the largest 4,200 plans offering a match did not recover to its pre-financial crisis level for almost a decade.

Vesting

- Vesting horizons have not changed substantially over the period we consider - employer contributions vest very slightly sooner than they did in 2003.
- Most firms (85%) offer vesting horizons that are shorter than the maximum length allowed by law.

Auto-features

- We document the large increase in the prevalence of auto-enrollment over the past two decades. Among the sample of the largest 4,200 plans, about 41.1% of firms auto-enrolled their members in 2017, up from 2.4% in 2003.
- The prevalence of auto-enrollment plus auto-escalation has also been increasing from virtually non-existent to 17.8% over the period 2003 to 2017 in our sample of large plans.
- The vast majority of plans that offer auto-enrollment have a default rate that is substantially lower than the level that would fully exploit the match offered by the employer. Only 36% of our sample of large plans default members at the maximum level to fully exploit the match, though the proportion of firms that do this has been rising over time.

This paper continues as follows: Section 2 gives details on existing data sets which have been used to study the evolution of retirement plan characteristics in the US and discusses how our new data set complements those sources. Section 3 turns to that new data set, and in it we characterize the population of plans that we are studying, discuss the manner of our sampling and describe the process by which we construct this new data set. Section 4 uses the data to describe the retirement plan characteristics observed in our sample, showing how those characteristics have evolved since 2003. Section 5 looks in more detail at the role of suspensions of employer matches. In each of Sections 4 and 5 we focus on results for our sample of large plans which cover a majority of the participants in our population of interest, whereas Appendix A provides corresponding graphs and tables for our (smaller) sample which is representative of the population. Section 6 concludes.

2. Existing data on retirement plans in the US

The aim of this paper is to provide descriptive evidence from a new data set on retirement plan characteristics. In this section we describe existing datasets which have been used to study such characteristics. These sources are i) The National Compensation Survey, ii) Proprietary Data Set from individual firms or groups of firms, iii) Household Survey Data, iv) Summary Data from Form 5500 Regulatory Filings. We discuss each in turn, before characterizing the complementary role that our new data set can play in describing the evolution of retirement plan characteristics in the US.

2.1 The National Compensation Survey

Basic descriptives on retirement plan participation and the core features of such schemes can be obtained from the National Compensation Survey², conducted by the Bureau of Labor Statistics. This survey is carried out to facilitate the construction of the Employment Cost Index (ECI), which can be used to measure changes over time in total employer compensation. Such data can be used to give a snapshot of the proportion of workers offered a match, and the proportion participating in different types of plans. Respondent firms are surveyed each year about retirement plan characteristics. Aggregated data on the participation in any plans offered is also collected. There is a limited panel component, with private sector firms remaining in the sample for three consecutive years. However, the most detailed data on retirement plans is collected only in the first year.³

The NCS has allowed researchers to document, for a representative sample, the long-term trend away from DB schemes (see for example Wiatrowski 2011 and Congressional Research Service 2020). The aggregated data on employee participation has been used to show a positive association between take-up of retirement plans offered by employers and the generosity of employer matching in those plans (Dworak-Fisher 2007). Butrica & Karamcheva (2012) use the data to show a negative association in the cross-section between the presence of

² More details on: <https://www.bls.gov/ncs/>

³ Additionally, no data is collected on plans where there is no match provided and only data on 'flat-match' DC plans is collected (that is plans where a match is provided up to a specified proportion of the employee's salary), see Butrica & Karamcheva (2012).

auto-enrollment and match schedules, providing suggestive evidence that firms see these retirement plan features as substitutes.

One limitation of the NCS for the specific study of retirement plans that our new data set will overcome is the lack of a substantial panel component. While private sector firms are followed for three years, the most detailed retirement plan information is collected in the first year. Our data contains information on firm plans for up to 15 years, allowing us to document the evolution of changes at the plan level over the long run and examine how changes in one instrument (e.g., the institution of auto-enrollment) associates with changes in others (e.g., the structure of the matching schedule). Our long panel will also allow us to look at the trajectory of the retirement plans of firms that chose to suspend contributions during the Great Recession.

2.2 Proprietary Firm Data

A large body of research on the interplay between retirement plan characteristics and employee behavior has used proprietary data on individual firms or groups of firms. Using proprietary plan-sponsor data, Mitchell et al. (2007) and Huberman et al (2007) provide evidence on the effect of matching and other plan features on employee contributions, while Madrian & Shea (2001), and follow-up studies including Choi et al (2002), Choi et al (2004), and Choukhmane (2021), focus on the effect of automatic enrollment on participation and contributions. Other papers, including Agnew et al. (2003), Ameriks and Zeldes (2004), and Parker et al. (2020), have used similar proprietary firm data to study employee asset allocation decisions.

In addition, a number of private recordkeepers and pension providers publish detailed data on the characteristics of the retirement plans they manage and the savings behavior of members in those plans (among others, the Vanguard Group “How America Saves” annual report (Vanguard 2020), and T. Rowe Price “Reference Point” annual report (T. Rowe Price (2020))). The most striking long-run changes that these reports show is growth of automatic savings features. Among Vanguard’s clients, only 2% of firms in 2004 had such plans; this rose to 50% by 2019. Among T. Rowe Price plans, this share has reached 62% of plans in 2019. These extremely rich data provide a wealth of useful descriptive statistics. They are not, however, necessarily representative of the population of US savers as the clients of a given recordkeeper are likely to differ systematically from those of other providers. Furthermore, the extent to which the sample is non-representative could be changing, complicating the interpretation of any changes over time. Drawing a sample from the population of retirement plans, as we do, allows us to estimate features of the retirement plan landscape that are representative of all US savers.

2.3 Survey Data

Lessons about employee responses to employer retirement saving incentives observed from proprietary data have been complemented by work using household survey data, in many cases linked to administrative records. The advantage of such survey data is that it contains information on household behavior alongside other rich economic and demographic characteristics of survey respondents and other household members. The latter are

not usually available in the type of firm-level data described above; our data contains only details on the retirement plan and sponsoring firm and no individual-level data is available.⁴ The strength of our employer-level data on the other hand is the detailed description of the retirement plan (e.g., full match schedules, full vesting schedules, comprehensive data on auto-features), which is not normally available in household surveys although in some cases (for example, the Health and Retirement Study), survey directors have managed to solicit employer data directly to complement the household-reported statistics.

One such example where this is leveraged is Engelhardt and Kumar (1997) who use a combination of the Health and Retirement Study, linked earnings administrative data, and summary plan descriptions provided to the HRS to study employee responses to match schedules. They find that employees respond to incentives in the match structure by saving more, but that responses are modest. A limitation of this dataset for studying the interaction of firm retirement plans and population household saving is that the HRS sample is restricted to older individuals and the match formula data is only available for a small number of individuals.⁵

Dushi et al. (2013) and Tamborini et al. (2013) use data on a sample of respondents from the Survey of Income and Program Participation linked to administrative records to investigate the impact of the Great Recession on employees' participation in and contributions to DC plans, finding that both fell substantially. Butrica & Smith (2012) use the same data and show that this sensitivity in contributions to economic conditions has been seen in other recessions.

2.4 Summary Data from Form 5500 Regulatory Filings

While the data set that we have put together relies on hand-coding the narrative descriptions of the retirement plans, some aggregated data on retirement plans are collected as part of the Form 5500 data and are available as a public use data set. While this does not include data on match schedules, vesting schedules or the detail on auto-enrollment defaults and auto-escalation, it does contain data on aggregate employer and employee contributions, along with a selection of firm and plan characteristics. They include the type of plan (e.g., Defined Benefit, Defined Contribution) and whether it has certain features (e.g. whether the firm has auto-enrollment). Brien and Panis (2013) use this data to study changes in aggregate contributions over the Great Recession. Andrietti (2015) uses this data to show that aggregate employer contributions increase when a firm introduces auto-enrollment.

We are aware of a small number of other projects that, like us, converted some of the rich detail contained in narrative filings into usable data. Bubb & Warren (2020) develop an equilibrium theory of retirement plan design and provide evidence for their theory using data on auto-enrollment defaults and match-schedules using a sample of approximately 2,000 firms. Rauh et al. (2020) study the freezing of corporate pension plans using data extracted from the Form 5500 filings of Defined Benefit plans.

⁴ In ongoing work, however, we are matching our firm-level data to employee-level administrative tax records.

⁵ Engelhardt and Kumar (1997) sample contains 372 individuals for which a positive matching formula is available.

3. Data

The Employee Retirement Income Security Act (1974) is a federal law which governs the provision of employee benefits, including retirement plans. Among other requirements, compliance with the Act requires an annual report from all retirement plans. The reporting involves submitting a completed 'Form 5500' to the U.S. Department of Labor, which contains key pieces of data - for example, the type of plan offered (DB or DC), the total number of participants, aggregate employer contributions, and aggregate employee contributions. Plans are also obliged to submit a narrative, 'Description of the Plan', which in the vast majority of cases will describe in free form text, amongst many other details, the match schedules (if any), vesting schedules (if any) and auto-features (if any). These narrative retirement plan descriptions are freely available to download online.⁶

Our creation of a new data set involves extracting from these narrative descriptions the passages relevant to matching, vesting and auto-features and hand-coding them into a new data set. The approach involved first finding the relevant key passages by identifying key words and phrases (e.g., 'Description of the Plan', 'matching', 'vesting' etc.), extracting the relevant pages for a sample of firms, reading the retirement plans and codifying them into a usable dataset.

The next sections give, in turn, the definition of the population of plans from which our sample is drawn, details on the nature of the two samples we draw and a discussion of the quality of the data that we have extracted.

3.1 Relevant Population

The population we have set to study is the set of 401(k) and 403(b) plans in the U.S. that satisfy two restrictions: that the plan i) is single-employer and ii) has an average of at least 100 participants in the years present.

Table 1 gives the number of plans and participants in the population we study and puts it in the context of all retirement plans that submitted a Form 5500 in 2003 or 2017 - the first and last years contained in our new data set. There were approximately 600,000 plans in 2017 that were either of the 401(k) or 403(b) type, with approximately 67 million active participants. Once we apply the two restrictions, we are left with a population of 55,155 plans with 56 million active participants. The population we set out to study, therefore, includes over 80% of individuals in 401(k) or 403(b) plans even though it contains only a minority of the universe of 401(k) and 403(b) plans.⁷

⁶ More details at <https://www.dol.gov/agencies/ebsa/about-ebsa/our-activities/public-disclosure/foia/form-5500-datasets>

⁷ Plans with fewer than 100 participants can complete a short version of the Form 5500 - the Form 550SF and face lesser reporting requirements.

Table 1: Population of Retirement Plans - 2003 and 2007

	Number	
	Plans	Active Participants
Panel A: 2003		
...Single Employer 401(k) /403(b) w. > 100 partic.	46,231	34,479,068
...Multi Employer 401(k) /403(b) w. > 100 partic.	2,095	4,226,747
... Other Defined Contribution w. > 100 partic.	5,636	5,400,765
... 401(k)/403(b) w. < 100 partic	310,471	7,049,147
...Other Defined Contribution w. <100 partic.	181,584	1,457,336
...Defined Benefit plans (all sizes)	34,209	16,764,309
Panel B: 2017		
...Single Employer 401(k) /403(b) w. > 100 partic.	55,155	56,364,240
...Multi Employer 401(k) /403(b) w. > 100 partic.	2,251	5,113,132
... Other Defined Contribution w. > 100 partic.	6,044	6,479,904
... 401(k)/403(b) w. < 100 partic	533,862	10,698,793
...Other Defined Contribution w. <100 partic	80,266	953,866
....Defined Benefit plans (all sizes)	47,855	12,933,648

3.2 Our Samples

In selecting a set of plans to be codified, we have two objectives. First, we would like a sample that covers a large proportion of U.S. plan participants. This objective would favor a choice to hand-code the data of mostly larger plans. Second, we would like to be able to draw inferences from our sample about the population. This objective would favor drawing a random sample. To accommodate both of these aims, we have hand-coded the plan features of two samples:

1. Our '**Large Plans**' sample. This is composed of the largest 4,200 plans in the US where plans are ordered according to the mean number of active participants over the period 2003 to 2018.⁸ The aim of this sample is to cover a large share of those who save in workplace DC schemes by focusing on the largest firms. In the body of this paper we focus on results using this sample.
2. Our '**Random Plans**' sample. Since the 'Large Plans' sample covers only the largest plans it is not, of course, representative of the population of U.S. DC plans or plan participants. Our 'Random Plans' sample provides a representative sample of the population. It randomly samples 1,086 plans from the population of all plans with more than 100 average active participants for the years present, where plans are sampled with a probability proportional to the mean number of active participants.⁹ The plan details are therefore representative of plan participants in the population of those in the U.S. who have access to workplace DC plans. Appendix A contains results using this sample.

Table 2 summarizes the number of participants per plan, in 2017, for the population and each of our samples. We show the mean and selected percentiles for each of 'active participants' and 'total participants'¹⁰. To reflect the criteria that we used to define a population to be studied, we exclude plans with fewer than 100 participants in these summary statistics.

In the population, the mean number of active participants is 1,122 with a median number of participants of 260. This indicates the substantial right-skewness of the number of participants (reflecting the underlying skewness in employees per plan).¹¹ The second column returns the fact that the distribution of participants per plan is, by construction, very similar to that in the population. The last column shows that the average number of active participants in the large plans sample is over 10,000. Even the smallest plan in this sample of larger plans is large - the mean (over years) number of active participants in this firm is 1,570 which is at the 90th percentile of mean active participants in the population, while the largest plan in our sample has an average (across years) of 1,150,373 active participants.

⁸ This is an average over all years even if the plan is not present - if a plan is not present in our data in a particular year the number of active participants is considered to be zero for that year.

⁹ We employed a two-stage cluster sampling with probability proportional to the size sampling algorithm to draw the random sample (please see Chapter 11 of Levy and Lemeshow (2008) for more information).

¹⁰ Active participants are defined as "any individuals who are currently in employment covered by the plan and who are earning or retaining credited service under the plan". Total participants is the sum of active participant and "retired or separated participants receiving benefits, other retired or separated participants entitled to future benefits, deceased participants whose beneficiaries are receiving or entitled to receive benefits". See page 17 of Department of Labor et al. (2018).

¹¹ The number of participants at the 90th percentile is 1,534, that at the 99th percentile is 15,167, while the largest 10 firms contain 3,768,174 participants or 5.62% of our population of participants.

Table 2: Participants per plan, Population, Random Plan Sample and Large Plan Sample, 2017

	Population	Samples	
		Random Plans	Large Plans
Active Participants			
... <i>Mean</i>	1,122	1,686	10,651
... <i>p10</i>	125	128	1,874
... <i>p25</i>	162	155	2,718
... <i>Median</i>	260	258	4,582
... <i>p75</i>	554	641	9,296
... <i>p90</i>	1,534	1,639	19,934
Total Participants			
... <i>Mean</i>	1,443	2,131	13,421
... <i>p10</i>	157	157	2,434
... <i>p25</i>	206	186	3,506
... <i>Median</i>	334	336	5,798
... <i>p75</i>	719	818	11,901
... <i>p90</i>	1,986	2,206	26,012
Number of Plans	50,056	746	3,461

Note: Our Large Plans sample contains an unbalanced panel of 4,200 plans and our Random Plans sample contains an unbalanced panel of 1,086 in total. The number of observations used in the construction of this table is lower as the table only includes those plans which are present in 2017.

As part of the Form 5500 reporting process, plans report the aggregate number of contributions made by employees, employers and the net assets held by all participants in the plan. Table 3 shows the mean of each of these variables.¹² We show these summary statistics both weighting each plan equally ('plan-weighted') and

¹² For the flow variables (contributions), we calculate the mean by dividing aggregates by the number of *active* participants. For the stock variable (assets), which will include the assets of non-active (e.g. separated) participants we calculate the mean by dividing the aggregate by the number of *total* participants. In a small number of cases, we get implausibly high averages, indicating either measurement error in aggregate measures or participant counts or a large change in the number of

weighting each plan in proportion to the number of participants ('participant-weighted'). Employee contributions are larger than employer contributions with means of \$3,353 and \$1,783 respectively.

Table 3: Mean Employer Contributions, Employer Contributions and Net Assets, 2017

	Population		Random Plans		Large Plans	
	Plan Weighted	Participant Weighted	Plan Weighted	Participant Weighted	Plan Weighted	Participant Weighted
Mean Emp'or Contribs. (\$)						
... <i>Mean</i>	1,783	2,065	1,776	2,025	2,389	2,180
... <i>Median</i>	944	1,094	1,093	938	1,539	1,187
Mean Emp'ee Contribs. (\$)						
... <i>Mean</i>	3,353	3,767	3,370	3,636	4,245	3,955
... <i>Median</i>	2,647	2,825	2,796	2,643	3,505	2,916
Mean Net Assets (\$)						
... <i>Mean</i>	53,812	66,546	50,599	66,451	74,640	72,924
... <i>Median</i>	34,605	40,839	30,056	40,091	51,564	45,155
Number of Plans	50,056		746		3,461	

Note: Our Large Plans sample contains an unbalanced panel of 4,200 plans and our Random Plans sample contains an unbalanced panel of 1,086 in total. The number of observations used in the construction of this table is lower as the table only includes those plans which are present in 2017. Cash values are expressed in 2018 dollar terms.

participants within a reporting year. We therefore drop observations where either the average employee contributions (including the catch up contributions) or the average total contributions (sum of employer and employee contributions including the catch-up contributions) are over the limits specified by Internal Revenue Service (IRS) for a given year. For 2017, the limit on employee contributions to a 401(k) or 403(b) (including the catch-up contributions) was \$24,000 and the maximum total contributions (including catch-up contributions) is \$60,000.

3.3 Data Quality

The fact that a firm is allocated to one of our two samples in our data does not necessarily imply that we can extract and codify the retirement plan characteristics. There are two distinct reasons why we may not be successful in codifying the data from the retirement plans.

The first is that ‘Description of the Plan’ might be missing from the Bureau of Labor’s database. This could happen due to a failure of the retirement plan to file it, a filing error occurring or a failure of our extraction algorithm to find the relevant description. Over our 15 years of data, an average of 10.6% of our Large Plans sample, and 12.1% of our Random Plans sample have a missing plan description. There is a large difference though, between the incidence of missing plan descriptions before and after 2009, a year in which the Form 5500 filing system was substantially altered and after which only electronic filings were accepted. Prior to 2009, approximately 20% of both of our samples had missing plan descriptions; after 2009, the incidence is much lower at approximately 4%.

The second reason that we may not be successful in codifying the retirement plan characteristics is that, in some cases where a plan description is found, there are plans where the details are not amenable to codification at scale. We group these cases into three categories: ‘no single schedule for all employees’, ‘schedule changed mid-year’ or ‘other’. Examples in this last group include cases where there are dollar caps on matching in addition to or instead of match schedules defined as proportions of employee caps, or if sufficient detail is not given to codify the plans.¹³

In this subsection we provide details on the outcome of our attempt to codify the information contained in the Form 5500 data. Our focus here is on describing the extent to which that attempt has been successful. We defer any discussion of patterns and trends in the variables we extract to Sections 4 and 5.

Table 4 describes the outcome for the match schedule. The ‘number’ column, the first in each panel, refers to the aggregate number of plan-years we have codified across each of our samples. The second column in each panel converts these quantities to proportions of our entire sample, the third converts them to proportions of plan descriptions (that is it excludes the 10.6% and 12.1% of cases where no plan description is found in our large and random plans data sets respectively). Focussing on those plans where we have a “description of plan” in the large plans sample (where the results are very similar in the random plans sample), we are able to codify the match rate described in almost 70% of plan descriptions. In 60% of cases the match rate is explicitly stated and is amenable to codification, in 9% of cases no mention of matching is found and, based on this omission, we assume that the plan does not provide any employer match. Of the 30% of plan descriptions where we could not fully codify the match schedule, in 9% of cases no single match schedule was found, in 2% of cases the match schedule changed mid-year and in just over 20% of cases the match schedule was too complicated to be amenable to large scale codification. In the vast majority of these 20% of cases, while we were not able to fully codify the match schedule,

¹³ For example, wording like “the Company matches up to 3% of compensation” allows for some ambiguity as to whether the firm matches 100% up to 3% or 50% up to 6% or some other combination of matches and caps.

it was the case that the firm did provide some match. In our analysis in Section 4 showing the evolution of the proportion of match schedules over time, we categorize these plans as providing a match, but are unable to describe the details of the match schedule.

Table 4: Codification Summary, Match Schedule

	Large Plans			Random Plans		
	Number	Prop. (of Total Sample)	Prop. (of Plan Descrps.)	Number	Prop. (of Total Sample)	Prop. (of Plan Descrps.)
Match rate codified	35,253	62.3	69.8	7,360	60.8	69.1
... <i>explicitly stated</i>	...30,715	...64.3	...60.8	...6,457	...53.3	...60.6
... <i>no mention of matching</i>	...4,538	...8.0	...9.0	...903	...7.5	...8.5
Match rate not fully codified	15,281	27.0	30.2	3,290	27.2	30.9
... <i>no single match schedule</i>	...4,273	...7.6	...8.5	857	...7.1	...8.1
... <i>changed mid-year</i>	...817	...1.4	...1.6	...186	...1.54	...1.8
... <i>other</i>	...10,191	...18.0	..20.2	...2,247	...18.6	...21.1
No plan description	6,018	10.6	---	1,466	12.1	---

Table 5 shows a similar table for our codification of vesting schedules. Focussing once more on the large plans sample (where the outcomes for the random plans are very similar), in 75% of plan descriptions either the vesting schedule is known and amenable to codification or no mention of vesting is identified. In this latter case we assume that employer contributions are immediately vested. Of the remaining 25% of cases, most are classified as ‘other’, meaning the vesting schedule was too complicated to codify at scale or insufficient detail was given in the plan description.

Table 5: Codification Summary, Vesting Schedule, Vesting Schedule

	Large Plans			Random Plans		
	Number	Prop. (of Total Sample)	Prop. (of Plan Descrips.)	Number	Prop. (of Total Sample)	Prop. (of Plan Descrips.)
Vesting schedule known	37,933	66.8	74.8	7,874	64.9	73.8
... explicitly stated	...32,253	...56.8	...63.6	6,770	...55.8	...63.5
...no mention of vesting	...5,680	...10.0	...11.2	1,104	...9.1	...10.4
Vesting schedule not fully codified	12,804	22.6	25.2	2,796	23.0	26.2
...no single vesting schedule	...3,020	...5.3	...6.0	...588	...4.9	...5.5
...changed mid-year	...132	...0.2	...0.3	...17	...0.1	...0.2
...other	...9,652	...17.0	... 19.0	...2,191	...18.1	...20.5
No plan description	6,018	10.6	---	1,466	12.08	---

The final two plan characteristics that we extract are the presence of auto-enrollment and auto-escalation. In these cases, codification is more straightforward than in the case of either matching or vesting. When either are present, in almost every single case we are able to codify the auto-enrollment default and, where relevant, the auto-escalation increase and cap. Where no mention is made of either auto-feature, we assume that none is present.

4. Matching Schedules

This section describes the characteristics of matching schedules in each of our samples and highlights how they have evolved since 2003. Section 4.1 summarizes the prevalence of matching and describes the most common matching formulas. Section 4.2 discusses the role of regulation, introducing the concept of ‘safe harbor’ matching schedules, which, if offered, exempt a firm from non-discrimination testing. Section 4.3 documents how the generosity of matching schedules has evolved over time. Section 4.4 discusses the extent of match suspensions during the Great Recession and the recovery thereafter. Unless otherwise stated, all analyses in this section are for our ‘large plans’ sample, corresponding analyses for our ‘random plans’ sample are given in Appendix A.

4.1 Types of matching formulas offered

Firms have wide discretion over what form of matching (if any) they offer. Figure 1 illustrates the three most common matching formulas in our large plans sample. The most common formula offers a 50% match on employee contributions up to 6% of employee salaries. An employee who fully exploits their match would therefore receive an employer contribution worth 3% of their salary. The next most common involves two distinct match tiers - an initial match of 100% match up to 3% of employee contributions, followed by a 50% match on the next 2% of employee contributions. An employee who saves to the cap would therefore receive an employer contribution worth 4% of their salary. The third most common match schedule is to simply match employee contributions dollar-for-dollar up to 4% of employee contributions.

Figure 1: Types of Matching Schedule

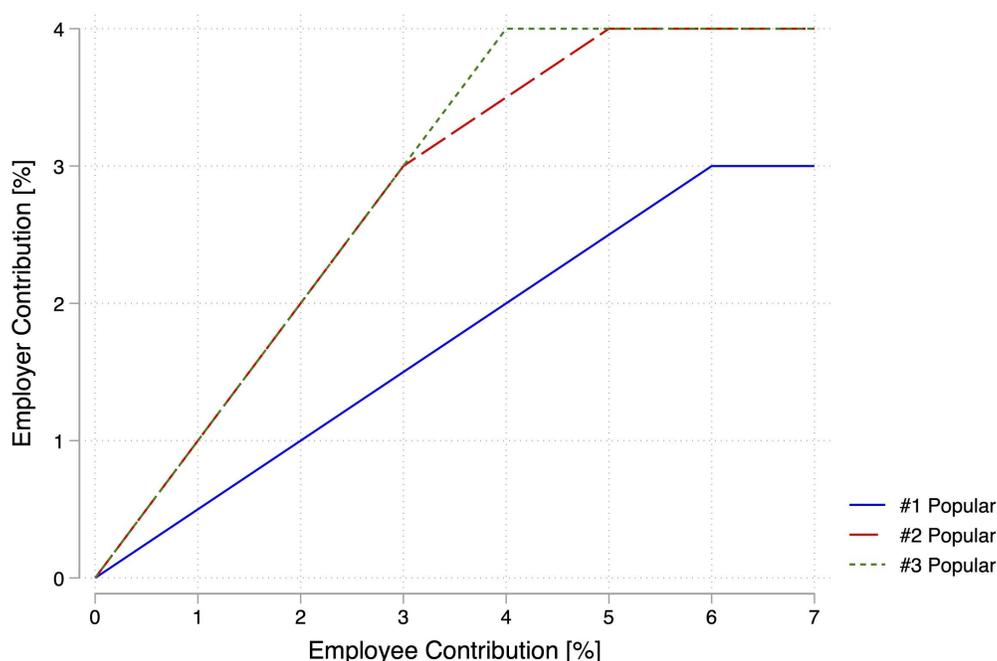


Table 6 gives the proportion of firms that offer an employer match and breaks this down into the share that offer a ‘single tier’ match (in which there is a single match rate up to a single cap, like in the most popular plan in Figure 1) and the fraction that offer more complicated match structures. The vast majority of DC retirement plans offer a match - 81% of plans, covering 86% of employees in our random plans sample. Approximately 70% of these are the simplest single-tier match schedules, with almost all of the remainder offering a match schedule that has two tiers. A very small minority has three different match rates.

Table 6: Frequency of Matching Schedule Types

	Large Plans		Random Plans	
	Fraction of Plans	Fraction of Participants	Fraction of Plans	Fraction of Participants
Offering Matching	0.811	0.836	0.807	0.855
Of which...				
... <i>Single-Tier</i>	0.730	0.728	0.701	0.711
... <i>Double-Tier</i>	0.267	0.258	0.279	0.259
... <i>Triple-Tier</i>	0.003	0.015	0.020	0.030

4.2 Safe-harbor matching formulas

While firms have control over what, if any, matching schedule they offer, this is not to say that regulation has no bearing on that choice. Every year DC plans are subject to non-discrimination testing to ensure that the benefits do not accrue disproportionately to certain classes of employees ('Highly Compensated Employees' - a category of employee that has a specific legal definition)¹⁴. Failing one of these tests may lead to costly fines, refunds, and tax penalties for the plan sponsor. The Small Business Job Protection Act of 1996 introduced safe-harbor formulas that eliminate the need to conduct annual nondiscrimination testing by adopting a plan with a relatively generous (and immediately vested) employer match. Effective in 1999, plans with the following matching formulas became exempt from non-discrimination testing:

- **'Basic safe-harbor match'**: a 100% match on contribution up to 3% of salary and a 50% match on contributions between 3% and 5% of salary.
- **'Enhanced safe-harbor matching formula'**: a 100% match on contributions up to at least 4% of salary.

The Basic and Enhanced safe-harbor match are respectively the second and third most common matching formulas plotted in Figure 1. The Pension Protection Act of 2006 introduced a third safe-harbor provision for matching plans that satisfy the following criteria starting from 2008:

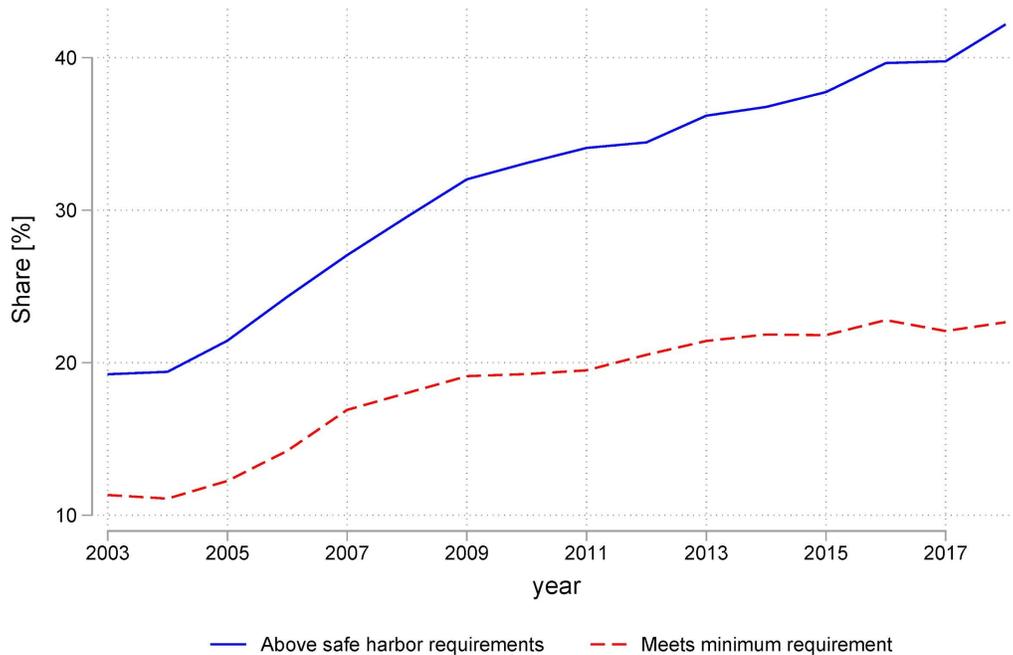
¹⁴ See <https://www.irs.gov/retirement-plans/plan-participant-employee/definitions>.

- **‘Qualified automatic contribution arrangement match (QACA)’:** To qualify for this a number of conditions needed to be satisfied. First, a matching contribution of either 100% up to 1% of salary and 50% up to 6% or 100% up to 3.5% of salary needed to be offered. Second, the plan needs to adopt automatic enrollment with a minimum deferral rate of 3%, and automatic increases of 1% a year for the next three years. Finally, employer contributions also need to be fully vested after 2 years.

Plan sponsors can make additional matching contributions on top of these guidelines and maintain their safe harbor status as long as the additional match satisfies the following requirements: (i) contributions above 6% of salary are not matched, and (ii) the additional matching contribution on top of the safe harbor match do not exceed 4% of compensation.

While safe-harbor provisions were initially introduced by the Small Business Job Protection Act in 1999 to make it easier for small businesses to offer retirement saving benefits, in 2017 more than 40% of large plans which offer matching in our sample had plan features (i.e. matching formula, vesting schedule and automatic enrollment provisions) which satisfied one of the three safe-harbor matching provisions (Figure 2).

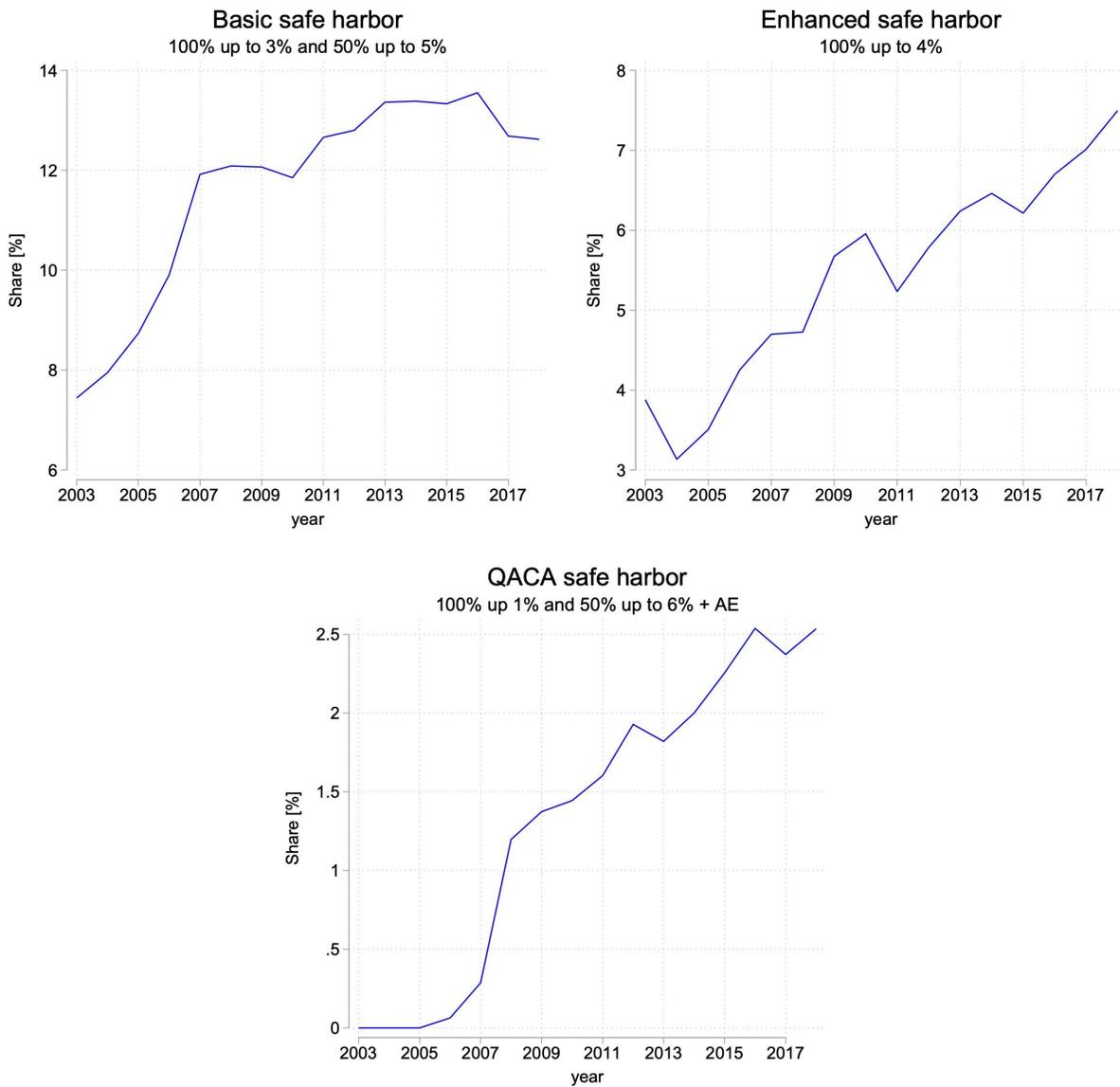
Figure 2: Safe Harbor Matching Plans



The widespread adoption of safe harbor matching formulas suggests that regulations play an important role in shaping employers' choice over which plan features to offer. The regulatory constraints set by these provisions are binding for many employers: in 2017, 22% of the large plans offered one of the three matching formulas which met the minimum requirement for one of the three safe harbor matching provisions (Figure 3). Safe-harbor provisions are therefore a powerful tool for policy-makers to encourage the adoption of specific plan

features, but employers may be slow to adopt these provisions. In 2003, four years after the basic and enhanced safe-harbor matching provision became effective, less than one in five large plans qualified for safe harbor matching, and by 2017 twice as many plans had features compatible with the safe harbor matching provisions. This pattern is consistent with some degree of institutional inertia, with plans being slow to adjust to regulatory changes, and/or with an increase in the desirability for safe harbor provisions over time. Similarly, the fraction of plans exactly at the minimum constraint set by the regulator doubled during the same period from 10% to over 20%. A similar pattern, albeit on a more modest scale, can be observed in Figure 3: after the introduction of the QACA safe harbor match provision in 2008, it was immediately adopted by only 1% of large plans but that share has been increasing steadily since.

Figure 3: Safe Harbor Matching Plans

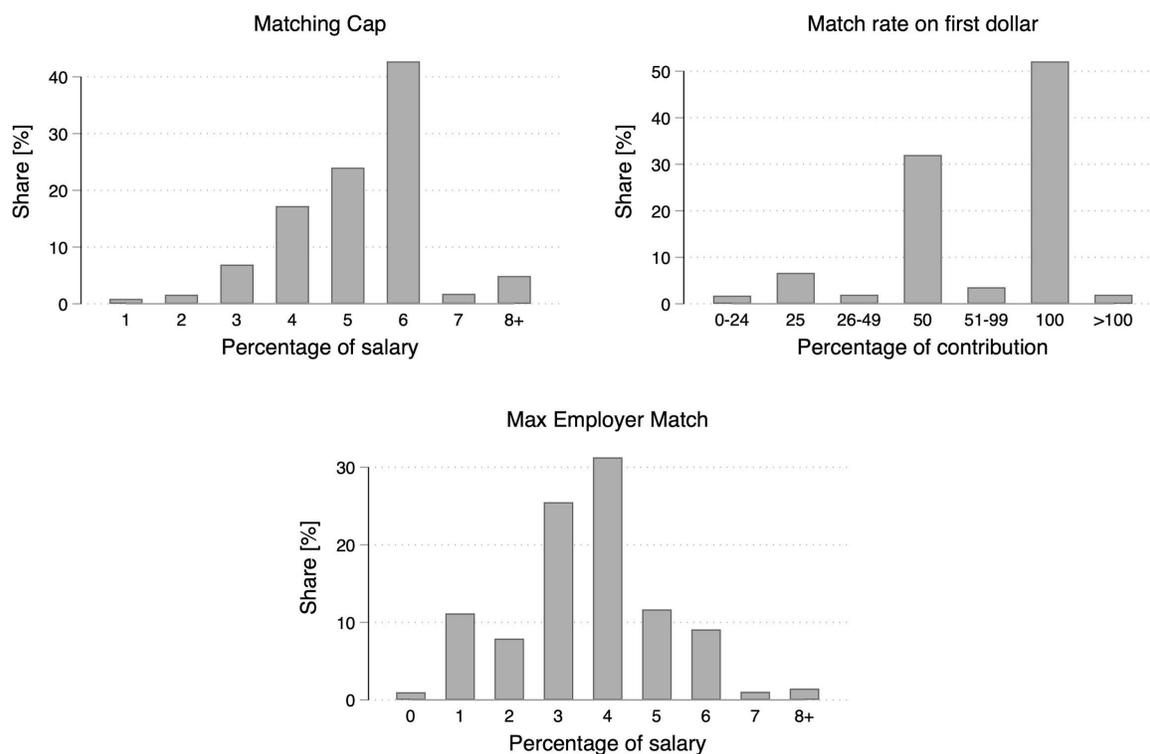


4.3 The generosity of matching formulas

The matching schedule is a multidimensional and relatively complex object. It has one or more match rates, which are applied between one or more sets of thresholds. As a precursor to showing how the generosity of matching has evolved over time, Figure 4 summarizes the cross-sectional distribution of match schedules in 2017 by showing the frequency of three different summary measures in our large plans sample. These measures are:

1. The **'Matching Cap'**. This is the proportion of the salary above which additional employee contributions yield no further employer contributions. The vast majority of plans that offer matching contributions match at least 3% of employee salary, and 40% of plans offer matched contributions up to 6% of employee salary. It is very rare that match schedules encourage employees to save more than this proportion of their salary.
2. The **'Match Rate on First Dollar'**. Our second summary measure of the match schedule is the matched contributions that employees receive on their first contributions - this is a key summary measure of the extent to which members of DC plans are incentivised, through matching, to do retirement saving. In approximately half of the cases in both our samples, the match rate on the first dollar is 100%, and in most of the remainder it is 50%.
3. The **'Maximum Employer Match'**. This is the total *employer* contribution if the *employee* fully exploits their match. Approximately a fifth of plans have maximum employer matches of less than 2% of salary, over half have maximum matches of between 2% and 4%, with the remaining third of plans having maximum matches of more than 4%.

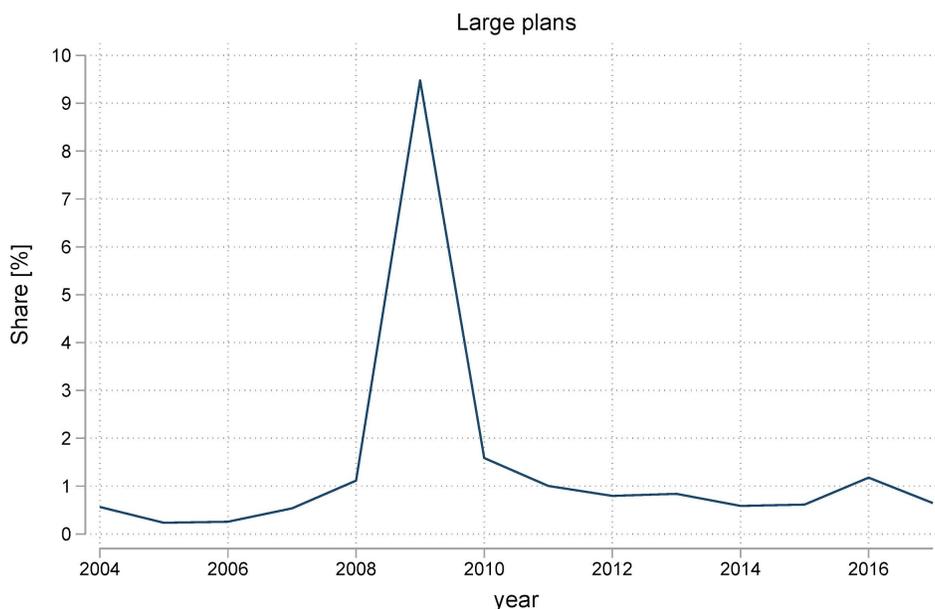
Figure 4: Summary Measures of Plan Generosity, 2017



4.4 Match suspension during the financial crisis

Employers are allowed to suspend matching contributions, including in the middle of the plan year, after notifying their employees. In a typical year, fewer than 1% of matching plans suspend their employer matching contribution. However, the option to suspend matching can be particularly valuable in a recession or a period of heightened macroeconomic uncertainty. Confirming earlier reports by Munnell & Quinby (2010) and Dushi et al. (2013), we document that in 2009, during the global financial crisis, 10% of large matching plans suspended their matching contributions (Figure 5). While 40% reinstated the match after a single year, the generosity and availability of matching contributions in those plans remained below their pre-2008 levels seven years later (Figure 6). We discuss these long-term effects in more details in section 5.5.

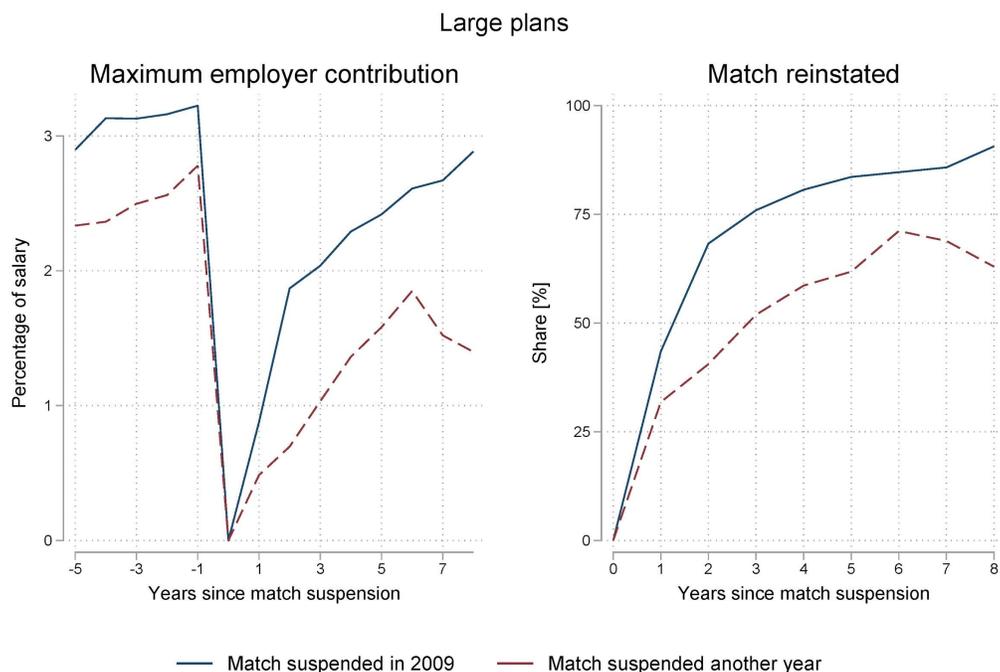
Figure 5: Share of plans that offered a matching contribution in year $t-1$ and suspended it in year t



The option to suspend employer matching benefits offers employers a relatively easy way to reduce their labor costs in response to adverse economic conditions. Benefits reduction can be implemented without re-negotiating individual contracts and may be less salient for employees than a nominal wage cut. Employer matching can therefore serve a less rigid form of compensation, and employers can use match formula adjustments as a way to share firm-level risk with their employees. This is similar to the findings of Efin et al. (2018) who document that firms use bonus pay as a way to share firm-level risk with their employees. The extent to which employers suspend matching contributions in recessions can have important macroeconomic implications. Counter-cyclical match suspensions can, at the same time, encourage household spending, alleviate firms' financial constraints, and improve the government fiscal position in a recession (Love, 2017).

The behavior of employers that suspended matching in a period of heightened macroeconomic uncertainty is quite different from that of employers who suspended their match in other years. Figure 6 illustrates this by showing the maximum employer contribution relative to the suspending year (left panel) and the proportion of suspending firms that reinstated their match (right panel). Plans that suspended matching in 2009 were on average more generous prior to the suspension and were quicker to reinstate the matching provision than plans that suspended matching in other years. 70% of plans that suspended their match in 2009 reintroduced matching within two years and of those more than 60% reinstated the same matching formula they had in 2008. This suggests that match suspension can be a way to smooth aggregate shocks or could reflect precautionary saving behavior in the face of heightened macroeconomic uncertainty.

Figure 6: Reinstatement Dynamics for Plans that Suspend a Match

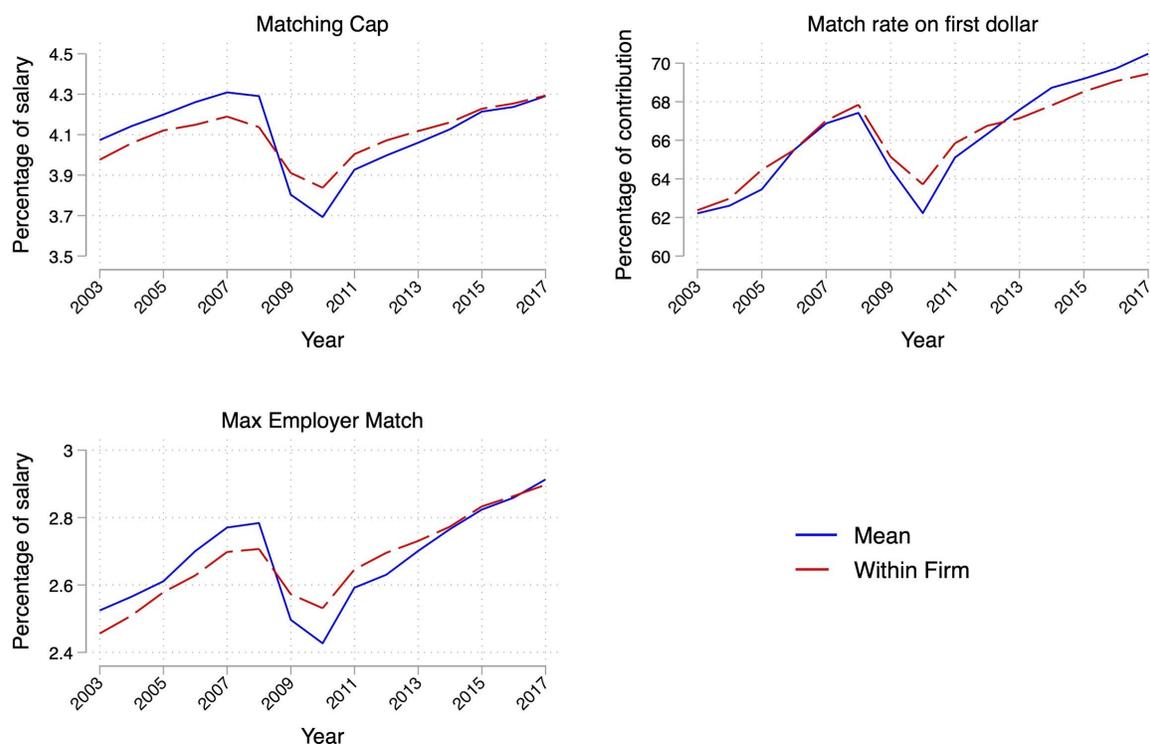


4.5 The long shadow of the Great Recession

Match suspensions during the global financial crisis cast a long shadow. Figure 7 shows how each of the three measures of plan generosity: i) the matching cap, ii) the match rate on the first dollar and iii) the maximum employer match, evolved over the period of 2003 to 2017 for our large plans sample. Each graph contains two time series. The first (solid blue line) gives the simple mean in each period. The second (dashed red line) gives a measure which takes into account the fact that new firms are entering and leaving our sample each year and aims to show the evolution of generosity for a sample of firms whose composition is constant.¹⁵ As we want to focus on changes that are not driven by changes in the composition of our sample over time, in our discussion, we focus on the latter measure.

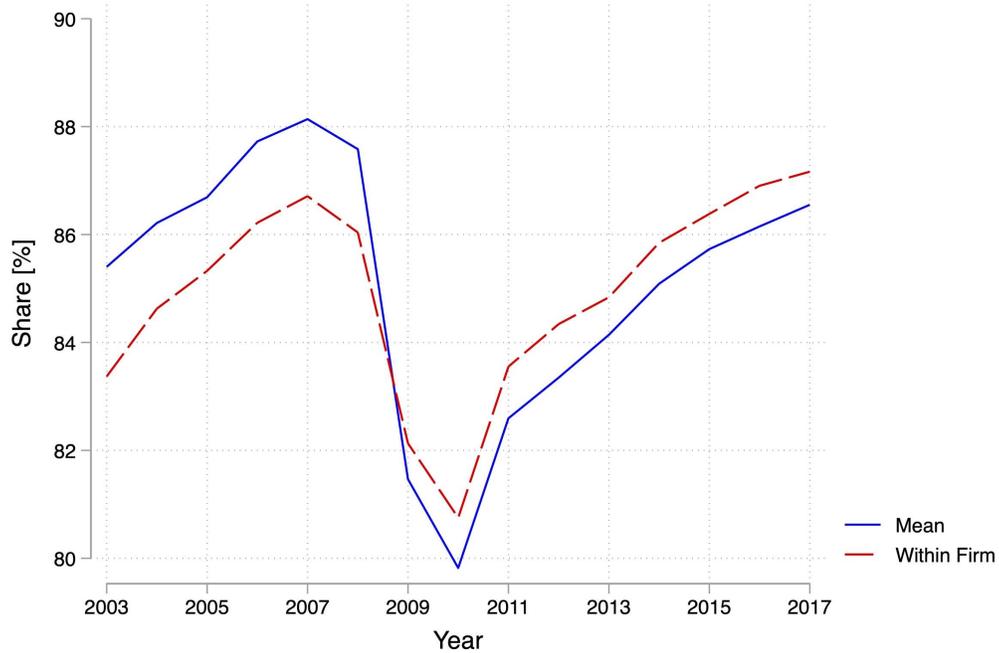
¹⁵ Formally, these are the coefficients from regression of the plan generosity measure on a set of year dummies with plan fixed effects. Changes in this profile are driven by firms switching their plans and not by firms entering or exiting the sample. The level can be interpreted as the level that would have prevailed if the composition of the sample was unchanged since 2003.

Figure 7: Summary Measures of Plan Generosity, 2003-2017



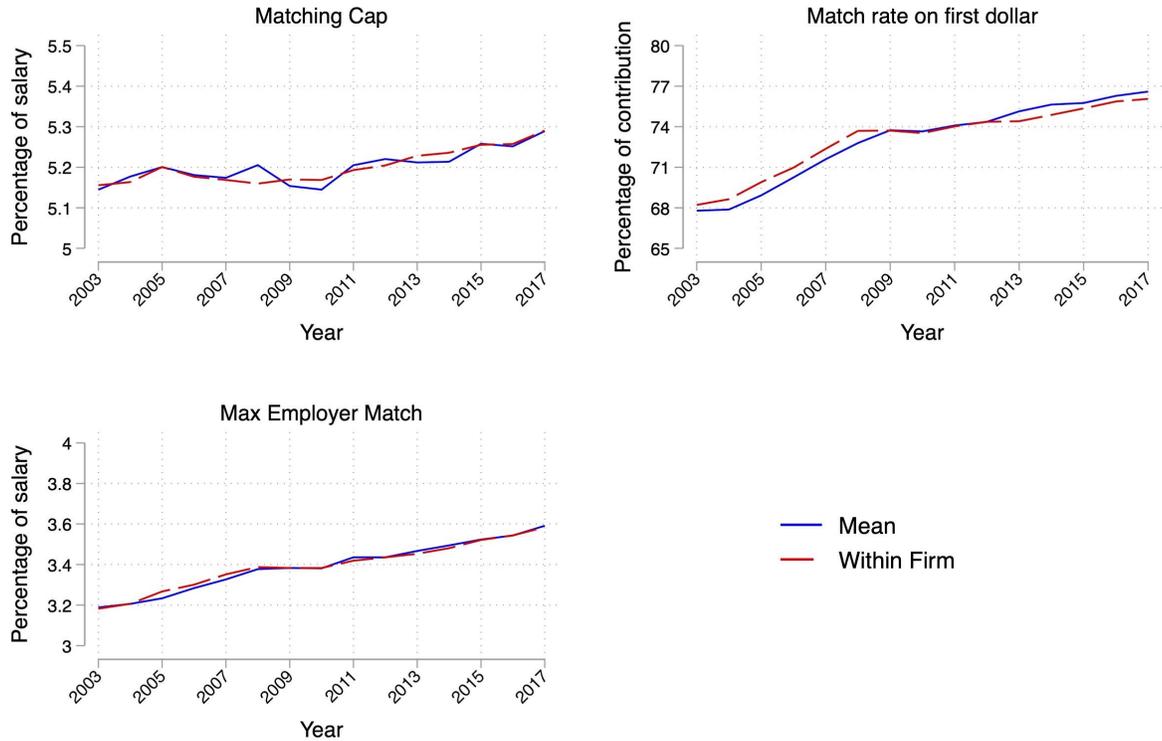
One salient feature emerges: the sharp drop in each of our three measures of generosity in the period 2007-2009. This reflects the incidence of firms suspending their match at the start of the Great Recession. While the extent of these matches suspensions has been documented before, for example by Munnell & Quinby (2010) and Dushi et al. (2013), the long-term effect of these suspensions has not received the same attention. In this paper, using the fact that we have a long panel, we can additionally document the longer-run evolution of match schedules in the aftermath of the Great Recession. While the average maximum employer match reached its pre-recession peak in 2013, the average match rate on the first dollar and the matching cap did not reach their pre-recession peak until 2015. Figure 8 shows the incidence of offering an employer match and further illustrates the sharp fall during the Great Recession and slow recovery thereafter.

Figure 8: Proportion of plans offering a positive match



It is instructive to assess whether the sharp falls documented in Figure 7 and subsequent recovery can be fully accounted for by the extensive margin changes shown in Figure 8. To investigate this, Figure 9 repeats the time series of the three generosity measures shown previously in Figure 7 but conditions on the firm offering a match (that is those firms which suspended or ended their match are dropped from the sample). In no case is a fall over the Great Recession period observed. The average matching cap was stable in the first half of the sample period before accelerating, the average match rate on the first dollar increased sharply over the first half of the sample period, with a gentler increase in the second half of the sample period, while the maximum employer match increased steadily over the whole period under consideration. This indicates that firms which responded to the Great Recession by altering their retirement plan contributions did so at the extensive margin (i.e. by suspending contributions) rather than at the intensive margin (i.e. by retaining matching contributions but at a lower level of generosity).

Figure 9: Summary Measures of Plan Generosity, Conditional on Positive Match Offered, 2003-2017



The combination of the analyses in this section indicates that the evolution of match schedules since 2003 can be characterized as comprising two phenomena. The first is a steady and gradual increase in the generosity of match schedules *for firms that continued to offer them*. The average individual saving in an employer-matched plan and fully exploiting their match would have had a combined contribution of 6.4% of salary in 2003 in our sample of large plans and 6.5% in our representative sample. This rose to 7.2% and 7.5% by 2017. The full time series of this quantity is shown in Appendix C. The second was the suspension, by a small but substantial share of firms, of the match schedules during the Great Recessions. This last phenomenon - suspensions of match schedules in times of economic distress - has unfortunately been reprised in 2020 during the period of economic turmoil caused by the Covid-19 Pandemic (Center for Retirement Research (2021)).

5 Other Plan Features

This section describes other important plan features - vesting schedules and automatic enrollment - and how those characteristics have evolved since 2003.

5.1 Vesting

As detailed in Section 4, employer matching plans provide significant additional compensation to employees. Even though for DC plans, participants are required to be immediately vested in their own contributions¹⁶, this rule does not extend to employer contributions, and many 401(k) plans require a minimum level of tenure before employees can take with them their full employer contribution at separation. These schedules come in two formats: ‘cliff’ or ‘graded’ vesting. Under a ‘cliff’ vesting schedule, an employee who separates from her employer before a specific period loses all the employer match contributed to her account, while an employee who separates right after that period is considered to be “fully vested” and gets to keep all the employer contributions made to her account. Workers separating from a firm with a ‘graded’ vesting schedule get to keep an increasing fraction of the contributions made by their employer after each year of tenure. The proportion of employer contributions that is vested increases after each year of service at the firm by a certain percentage (usually by increments of 20%) until matching contributions are 100% vested.

The Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRR) introduced limits on the length of vesting periods for employer matching contributions. Since 2002, all DC plans with a cliff vesting schedule must fully vest all employer matching contributions in no more than three years, and all graded vesting plans must be at least 20% vested after two years and must increase the share vested by 20% each year until 100% after six years.¹⁷ Our sample period lies exclusively after the implementation of EGTRR, and as shown in Figure 10, the maximum limits set by the EGTRR are only binding for a minority of plans as most firms already offer more immediate vesting than is legally required. Approximately 15% of firms in our large plans sample follow one of the two maximum vesting schedules authorized by the law, and this share has remained steady over time.

¹⁶ See Employment Retirement Income Security Act of 1974, Public Law No. 93-406, §1012, <https://www.govinfo.gov/content/pkg/STATUTE-88/pdf/STATUTE-88-Pg829.pdf>

¹⁷ The Economic Growth and Tax Reconciliation Act of 2001, Public Law No. 107-16, §633, <https://www.congress.gov/107/plaws/publ16/PLAW-107publ16.pdf>

Figure 10: Proportion of large plans sample providing longest-allowed vesting schedule

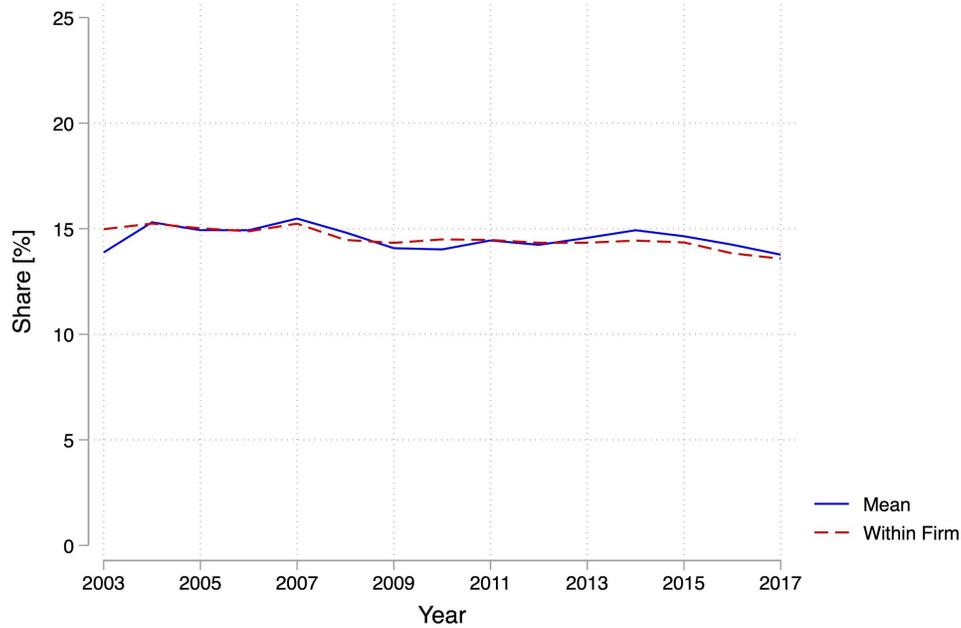
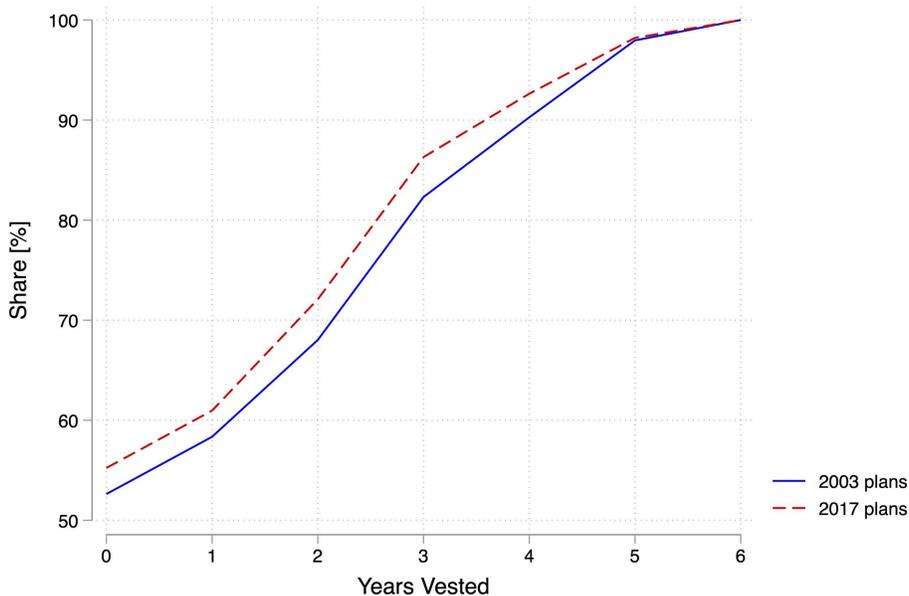


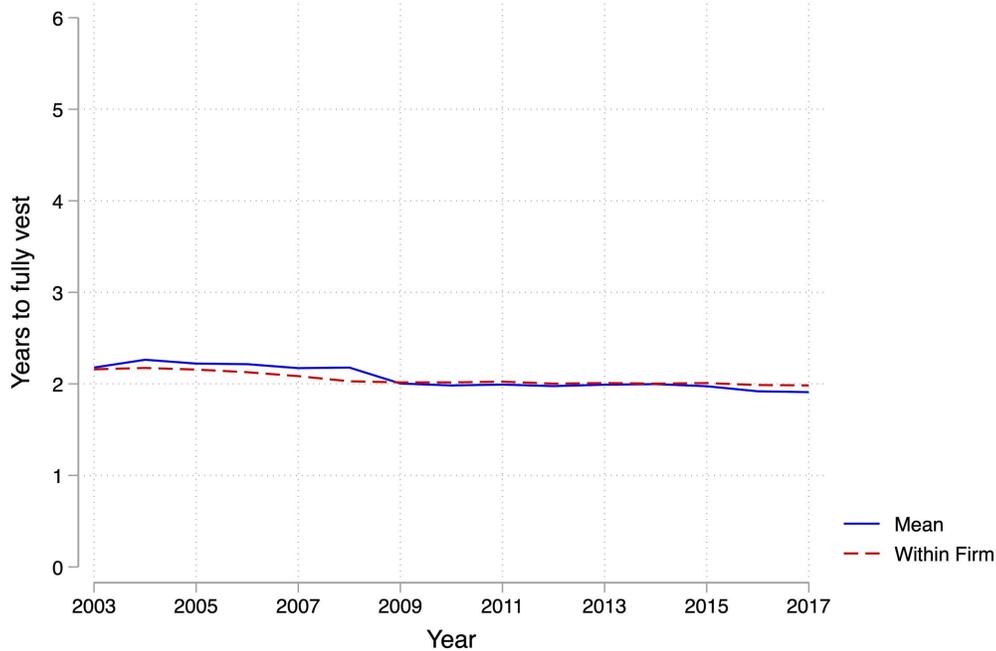
Figure 11 outlines the average proportion vested each year for plans in 2003 and 2017. The sample was limited to plans that abide by EGTRR guidelines. As a result, all plans are 100% vested after six years. For the large sample, over 80% of plans are 100% vested after three years. Over the entire course of our sample period, for both samples, there has been a modest shortening in the time it takes for employer contributions to vest.

Figure 11: Average proportion vested each year for plans in 2003 vs. 2017



Next, we examine how the number of years to fully vest changed over time in Figure 12. For large plans, both the mean and within firm coefficients show that the average number of years to fully vest fell slightly between 2003 and 2017, from 2.2 to 2 years for within firm. In addition, the fraction of large plans vesting immediately (or fully vesting within three years) has remained steady over the past 15 years at around 50% (and 70%), respectively.

Figure 12: Average number of years to fully vest over sample period



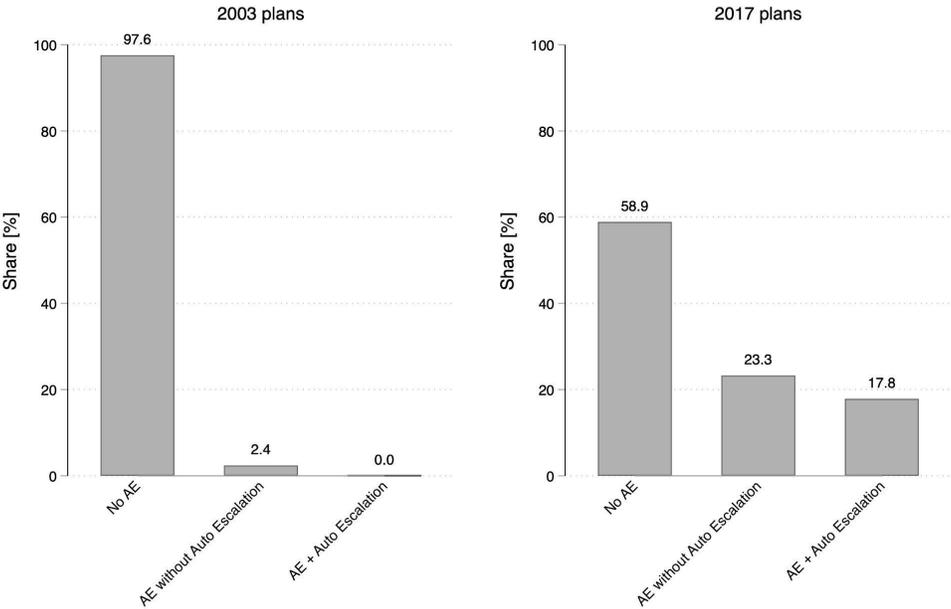
Overall, firms' vesting features have seen little change over the past two decades, contrary to matching (as we documented in the prior section) or especially auto-features, to which we now turn.

5.2 Automatic Enrollment

One of the most dramatic changes in the Defined Contribution retirement landscape in recent years is the widespread adoption of automatic enrollment. In 2003, 98% of large plans operated under an opt-in regime in which employees must actively elect to participate. Following the Pension Protection Act of 2006, an increasing number of employers moved to an automatic enrollment regime in which new hires contribute by default and can elect to opt-out from participating. The Pension Protection Act of 2006 encouraged the adoption of automatic enrollment by (i) providing fiduciary relief for the choice of a default investment option, and (ii) offering protection against state anti-garnishment laws which prevent employers from withholding wages without the consent of their employees. By 2017 more than 41% of our large plans sample offered

auto-enrollment, often in combination with auto-escalation (a feature under which the participant contribution rate increases automatically every year up to a cap unless the participant actively elects to retain contributions at their previous level). As shown in Figure 13, close to half of automatic enrollment plans also offered an auto-escalation feature in 2017.

Figure 13: Proportion of firms with auto-features, 2003 and 2017



Figures 14 and 15 show that the increase in auto-enrollment and auto-escalation has been steady over the period we consider.

Figure 14: Proportion offering auto-enrollment over time

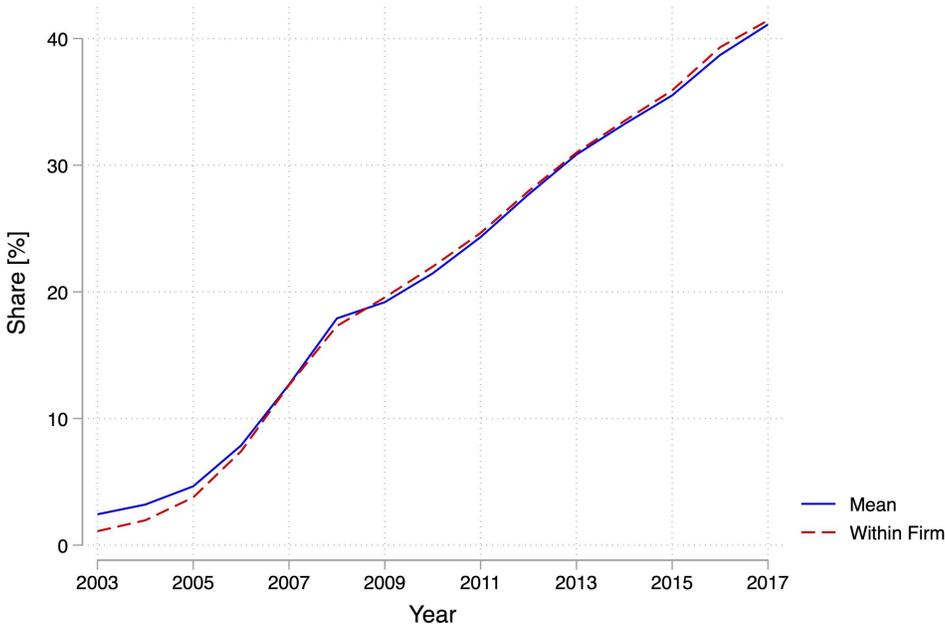
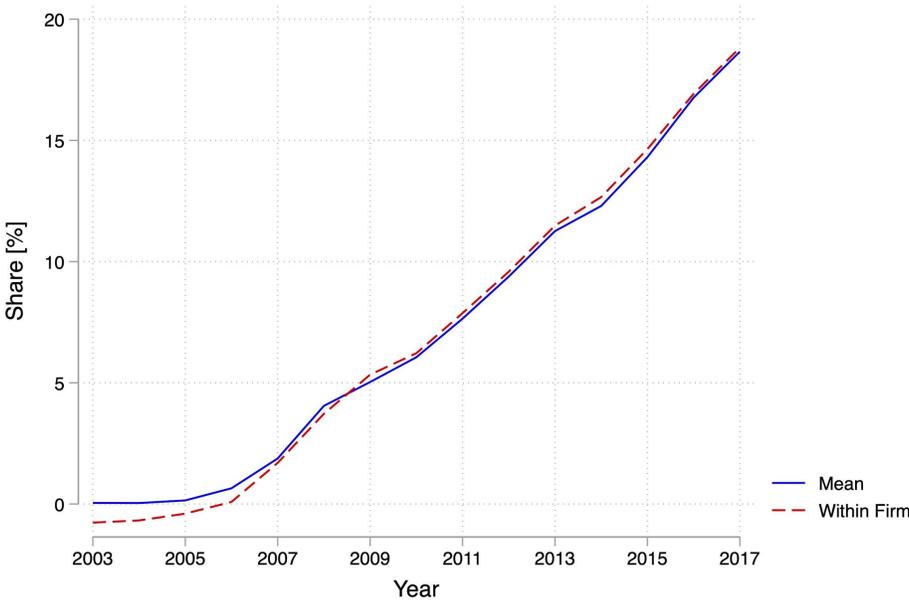


Figure 15: Proportion offering auto-escalation over time



A key choice that employers must make when they decide to institute auto-enrollment is what the default rate should be - that is the proportion of their salary that employees who make no active savings choice will save at.

Figure 16 shows how the mean default rate has increased over time with the average default contribution rate rising from 3% to 3.8% of salary between 2003 and 2017.

Figure 16: Average Default Rate - 2003 to 2017

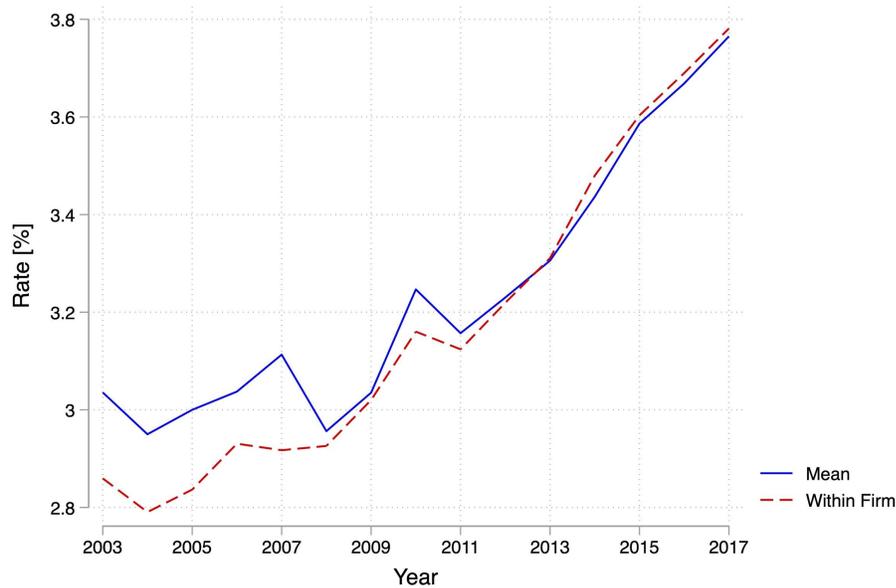


Figure 17 looks in more detail at the distribution of default rates, and how they compare to the matching schedules. Panel a) looks at the distribution of defaults - the most common autoenrollment default is 3% of salary throughout the sample period. Because a large number of employees stay at the autoenrollment default (see, for example, Choi et al, 2004), the choice of an adequate default contribution rate can have an important effect on participants' behavior. A default that is too low may anchor participants at an insufficient saving level, while a default that is too high may induce more participants to opt-out from the plan. A number of recent papers have addressed the question of how to balance these different considerations and select an optimal automatic enrollment default (Bernheim et al, (2015); Goldin and Reck (2020), Choukhmane (2021)). A common finding in these studies is that, in the presence of a non-linear matching incentive, the optimal default is often equal to the cap on employer matching.¹⁸ However, Bubb and Warren (2020) develop a model which predicts that a profit-maximizing employer will not select the employee welfare-maximizing default and instead set the default below the cap on matching to prevent biased employees from fully exploiting the matching incentive. In line with their empirical evidence from 2010 and 2011, we document in the right-hand graph in Figure 17—which shows the distribution of the ratio of the deferral to matching cap—that a majority of

¹⁸ Bernheim and Mueller-Gastell (2020) show that under quite general conditions setting the default equal to the opt-out minimizing rate is approximately optimal. Since many employees who make an active decision choose to bunch at the cap on matching, it is a good candidate for minimizing opt-outs. Quantitatively and under a wide range of assumptions across three different studies, Bernheim et al, (2015); Goldin and Reck (2020), Choukhmane (2021) all find that the cap on matching is often the optimal default contribution rate.

employers have selected an automatic enrollment default below the cap on matching. However, as Figure 18 shows, an increasing number of plans has moved toward this likely-to-be ‘optimal’ default contribution rate, with the fraction of automatic enrollment plans setting their default equal to the cap on matching increasing from 15% to 36% between 2003 and 2017.

Figure 17: Distribution of default rate and relationship between default rates and match caps

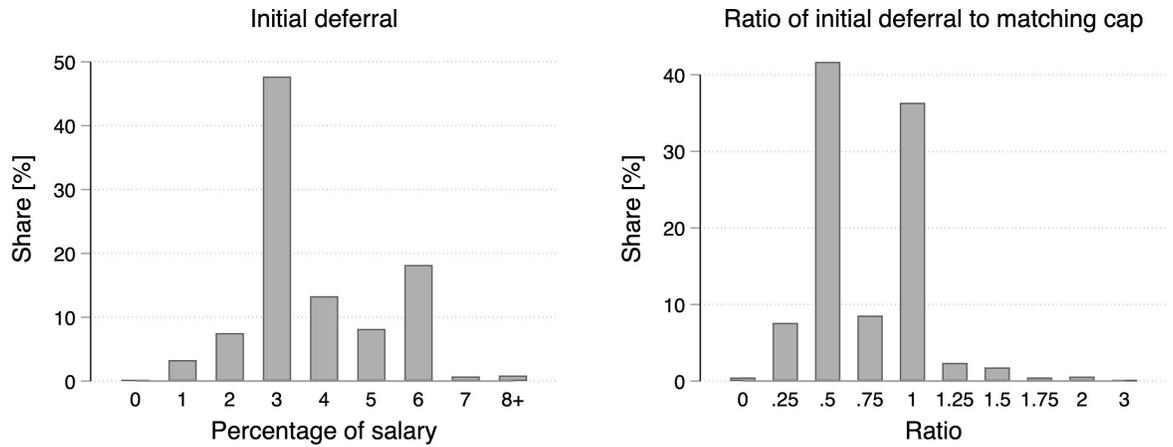
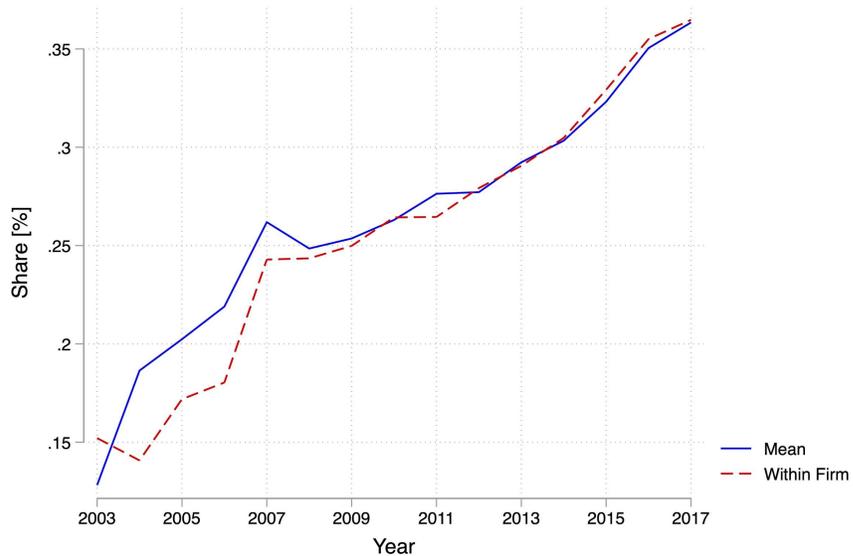


Figure 18: Time-series fraction of Auto-Enrollment Plans which equated matching cap and auto-enrollment default



6 Conclusion

This paper has described the construction of a new data set based on hand-coding the information contained in narrative descriptions of retirement plans for a large sample of US Defined Contribution Retirement Plans. We focus on matching schedules, vesting horizons and the details of any auto-features.

While vesting horizons have changed very little for employer-sponsored DC plans over the period, we note two long run trends for the other two plan features. First, auto-enrollment is becoming increasingly common. Second, there has been a trend towards more generous matching schedules for firms that offer them, albeit that this trend was interrupted by widespread suspensions of matching contributions during the Great Recession. The effect of these suspensions was felt in some affected firms for up to a decade. Future research might extend the data collection we undertook here to examine the incidence and composition of firm match suspensions during the recent period of economic disruption caused by the Covid-19 pandemic.

Appendix A: Random Plan Figures

For summary measures of plan characteristics from our large plans sample contained in the body of the paper, this Appendix provides summary measures of the plan characteristics for our ‘random plans’ sample. We number the figures as we do in the body of the paper, with a prefix A attached - as a result the numbering in some cases is non consecutive.

All the results in this appendix weight plans by the number of participants - therefore they should be interpreted as summary statistics pertaining to the population of DC contributors rather than the population of DC plans. Finally, note that this sample is smaller than our large sample, so the statistics presented in this appendix are less precisely estimated than those presented in the body of the paper.

Figure A.2: Safe Harbor Matching Plans

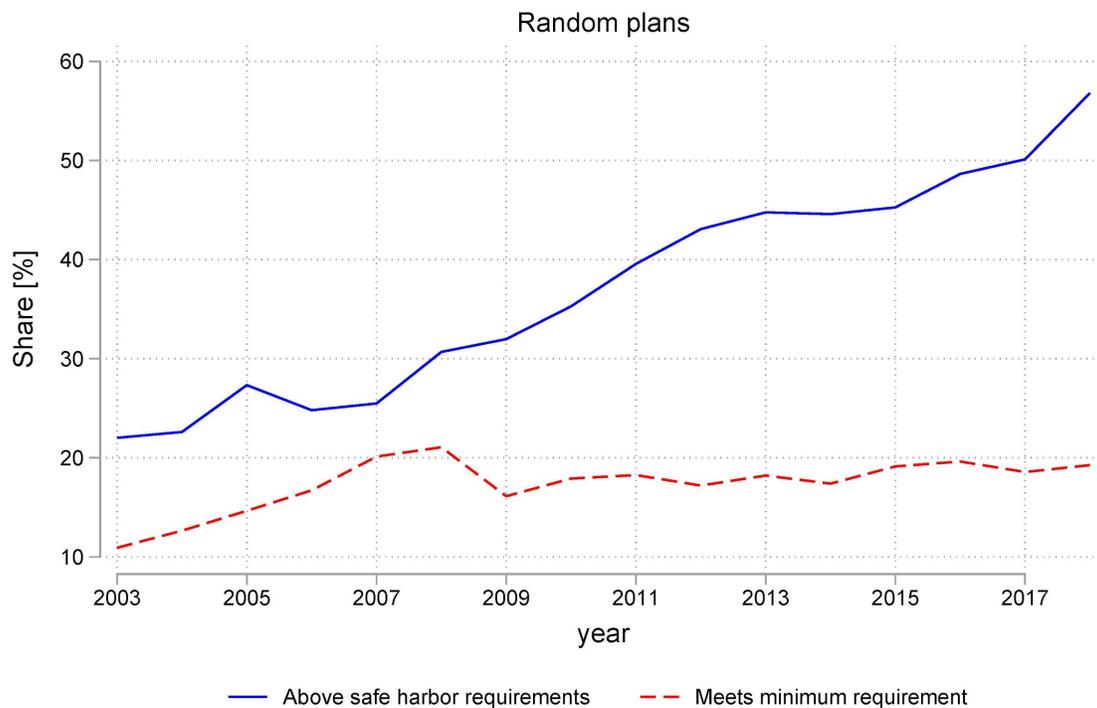


Figure A.3: Safe Harbor Matching Plans

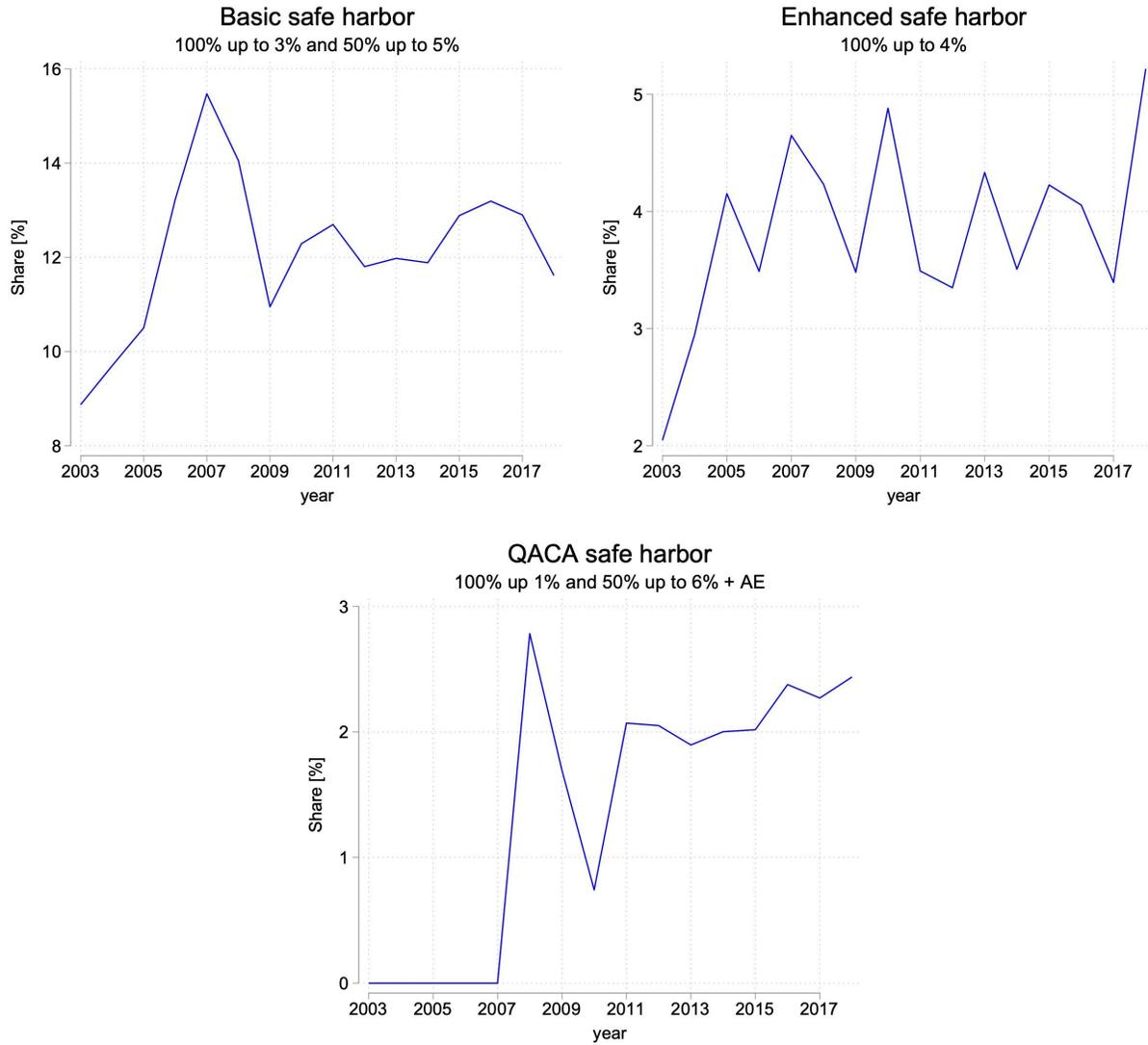


Figure A.4: Summary Measures of Plan Generosity, 2017

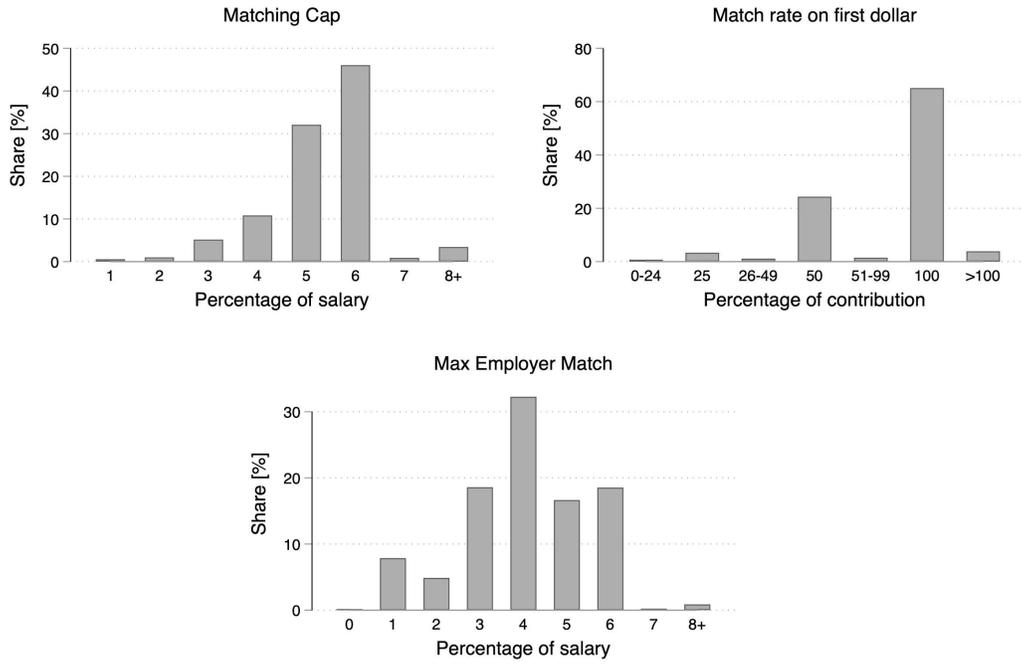


Figure A.7: Summary Measures of Plan Generosity, 2003-2017

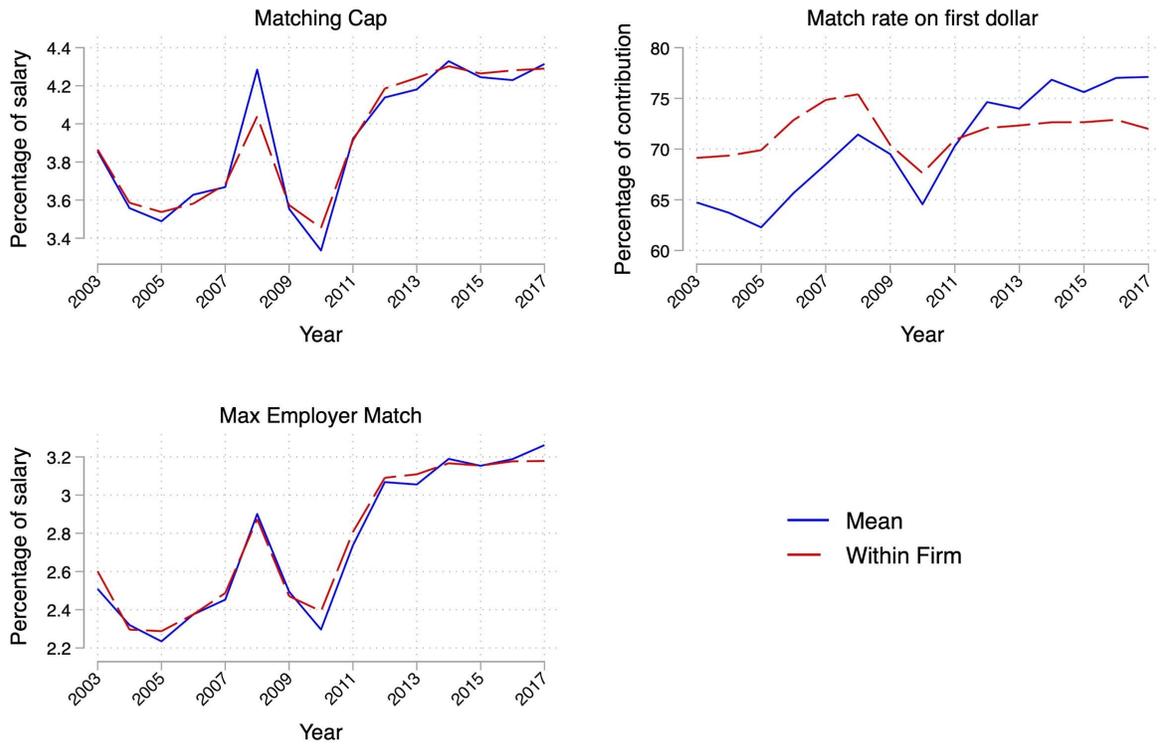


Figure A.8: Proportion of plans offering a positive match

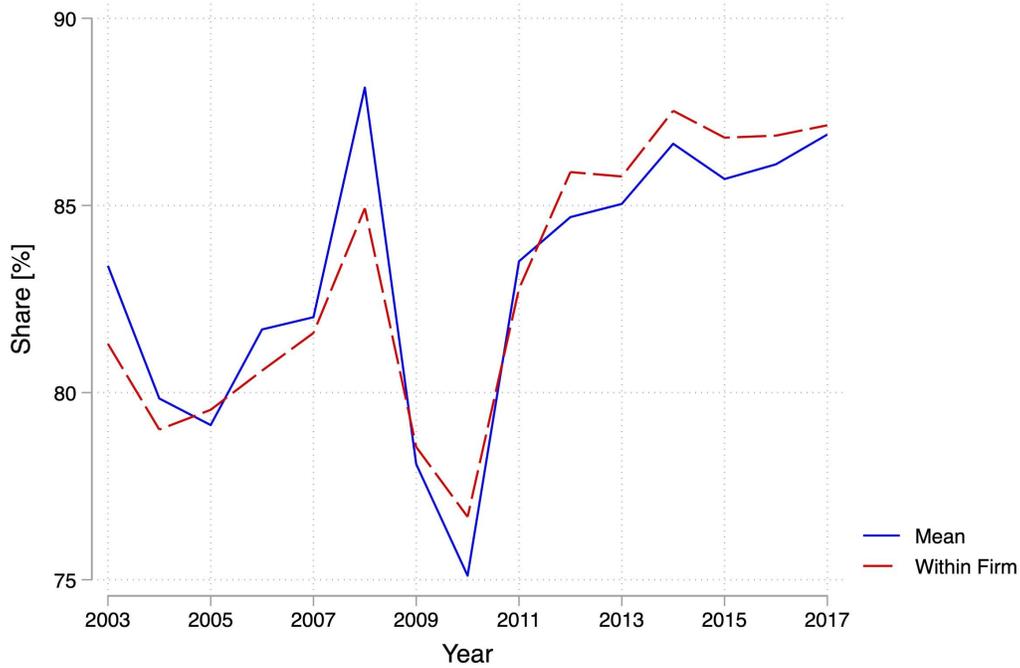


Figure A.9: Summary Measures of Plan Generosity, Conditional on Positive Match Offered, 2003-2017

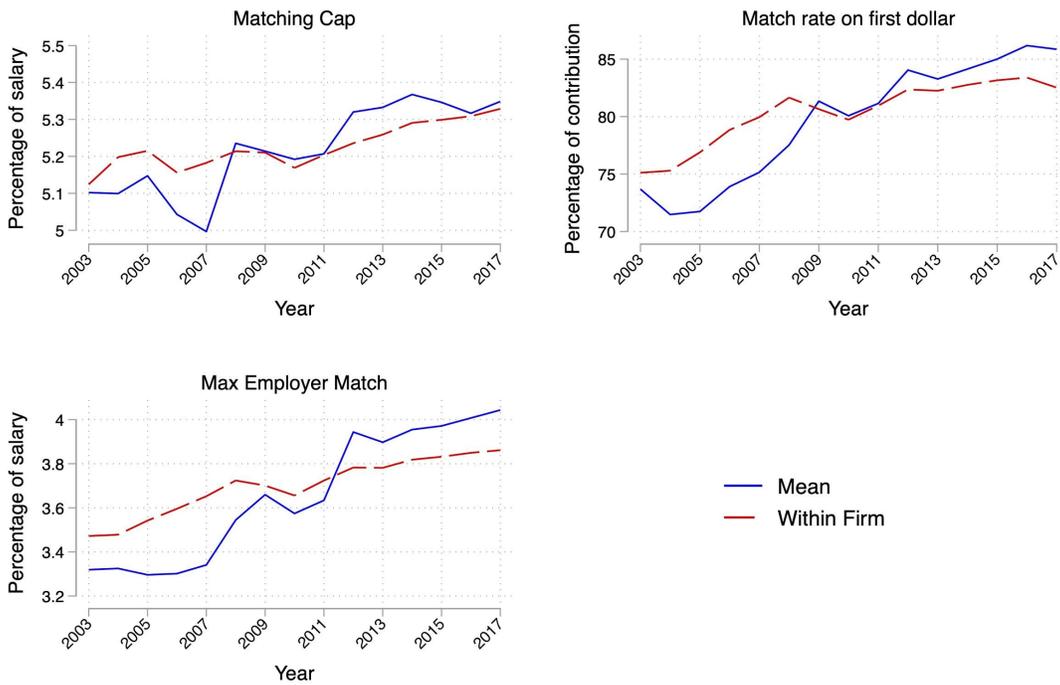


Figure A.5: Share of plans that offered a matching contribution in year $t-1$ and suspended it in year t

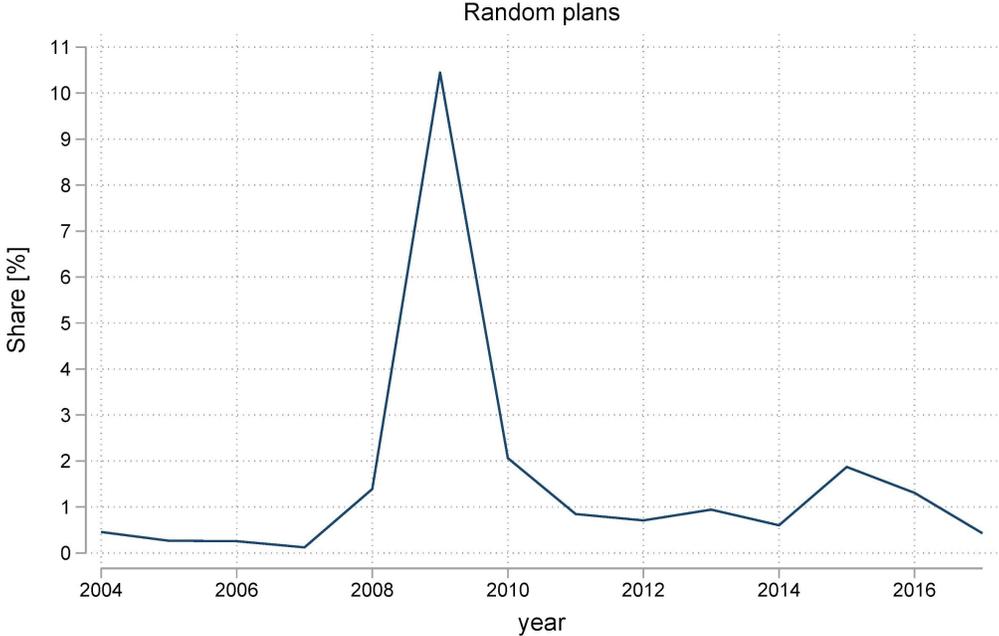


Figure A.6: Reinstatement Dynamics for Plans that Suspend a Match

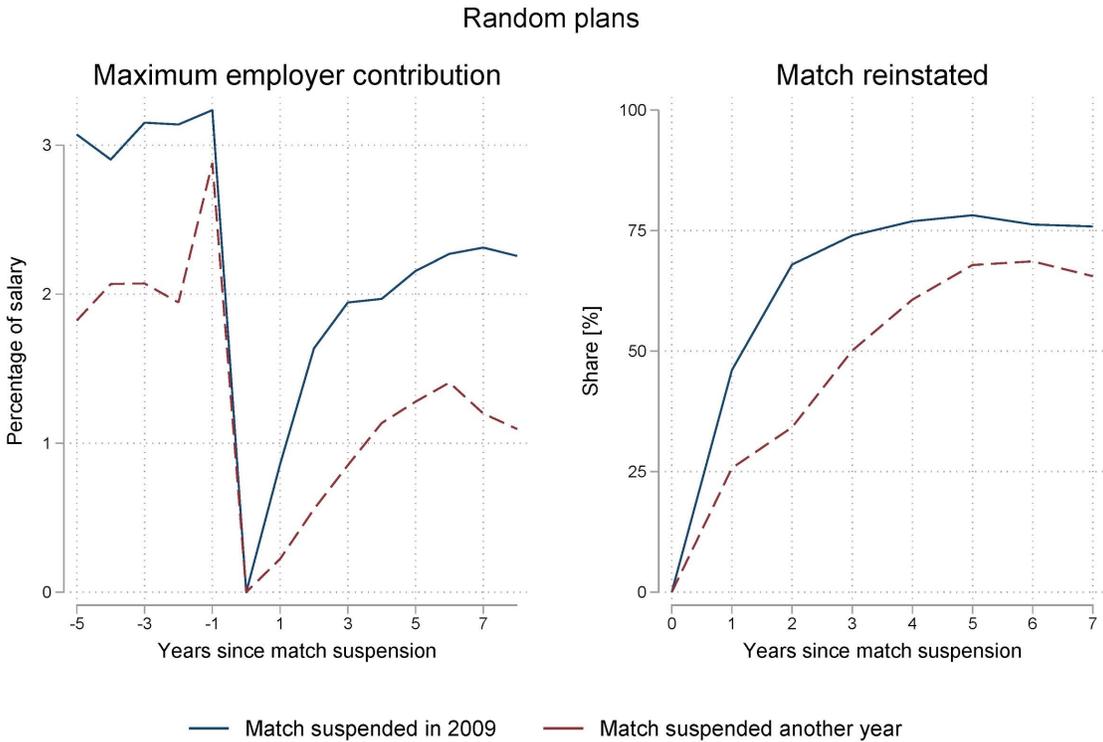


Figure A.10: Proportion of random plans sample providing longest-allowed vesting schedule

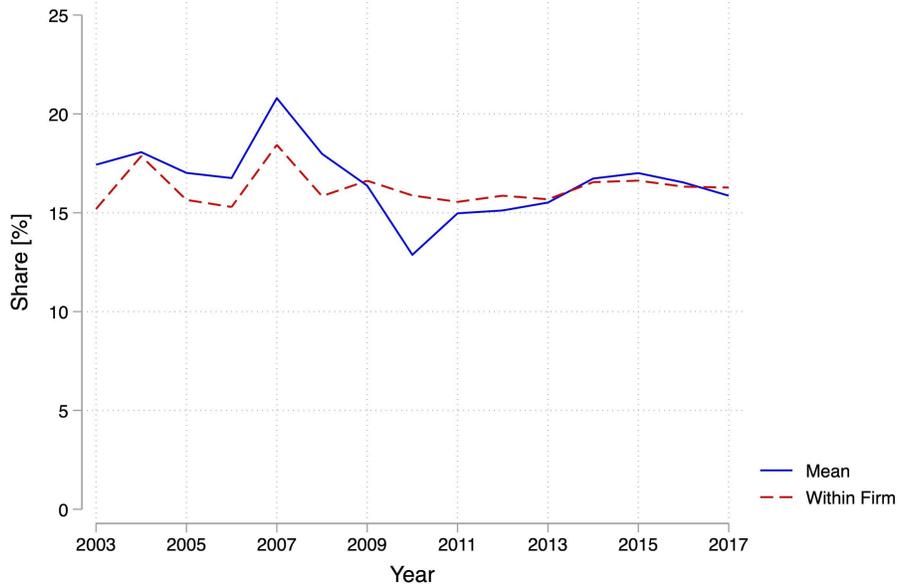


Figure A.11: Average proportion vested each year for plans in 2003 vs. 2017

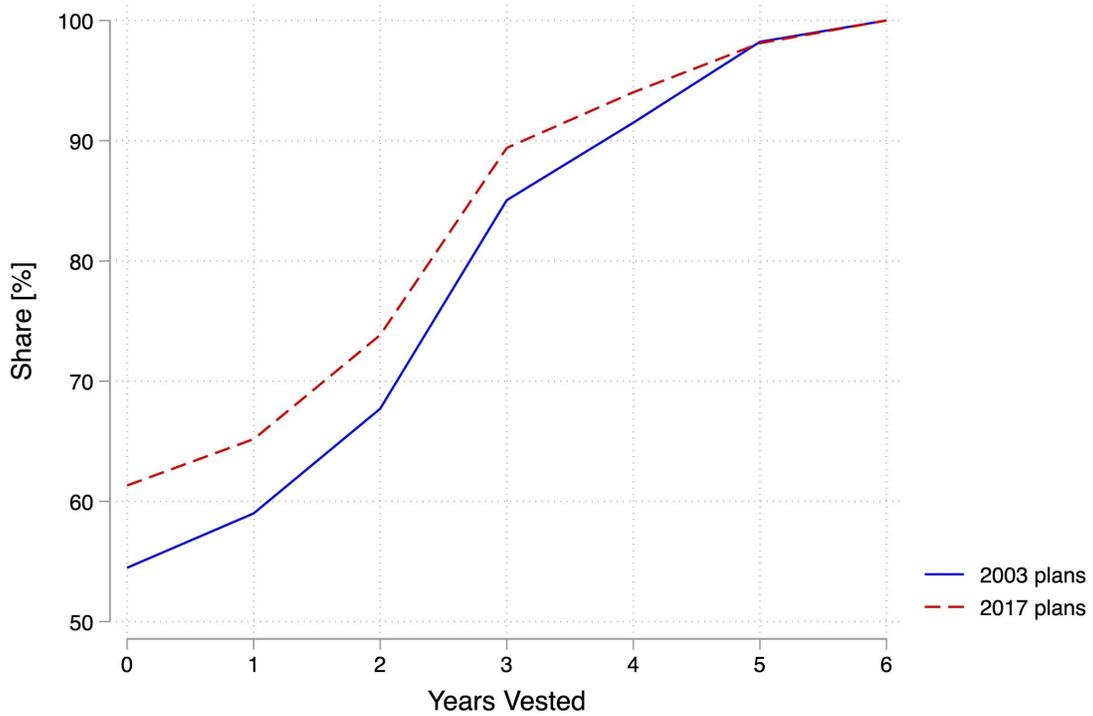


Figure A.12: Average number of years to fully vest over sample period

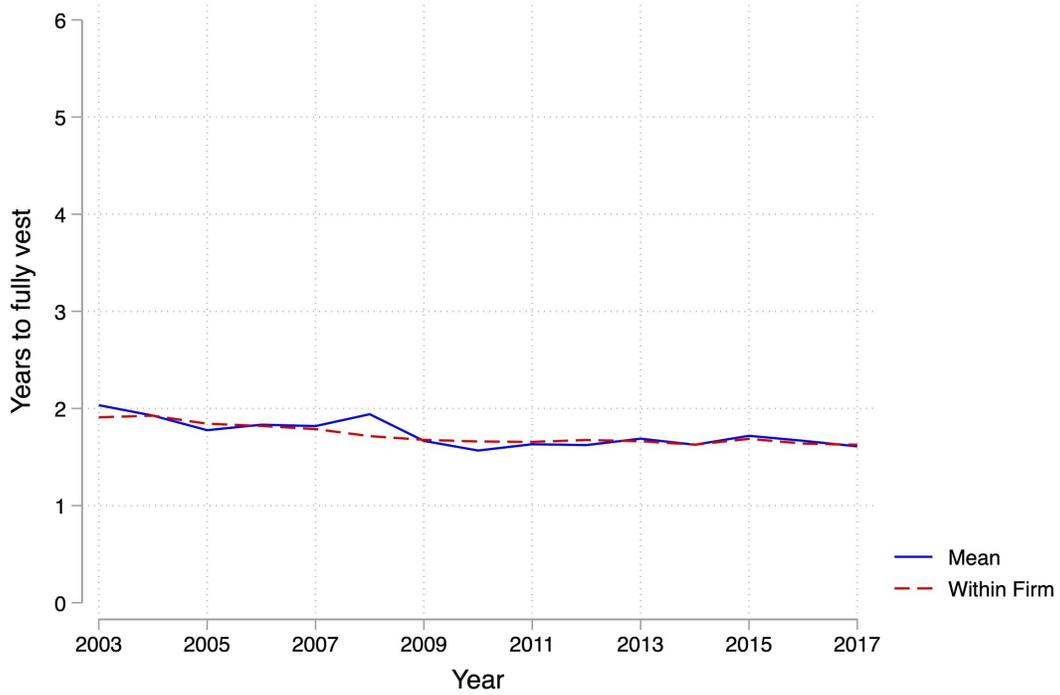


Figure A.13: Proportion of firms with auto-features, 2003 and 2017

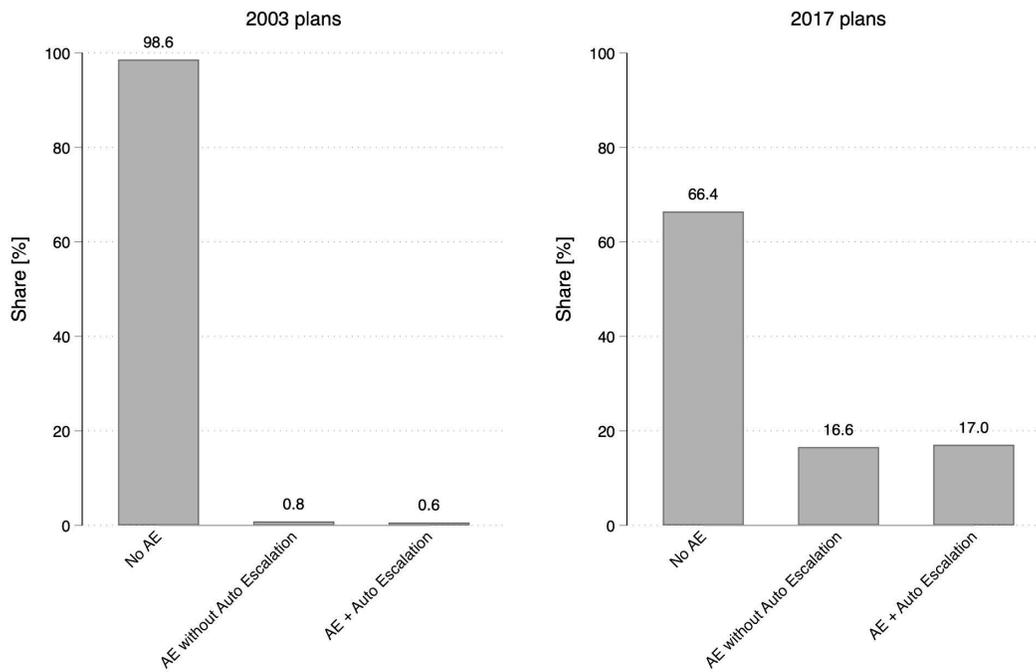


Figure A.14: Proportion offering auto-enrollment over time

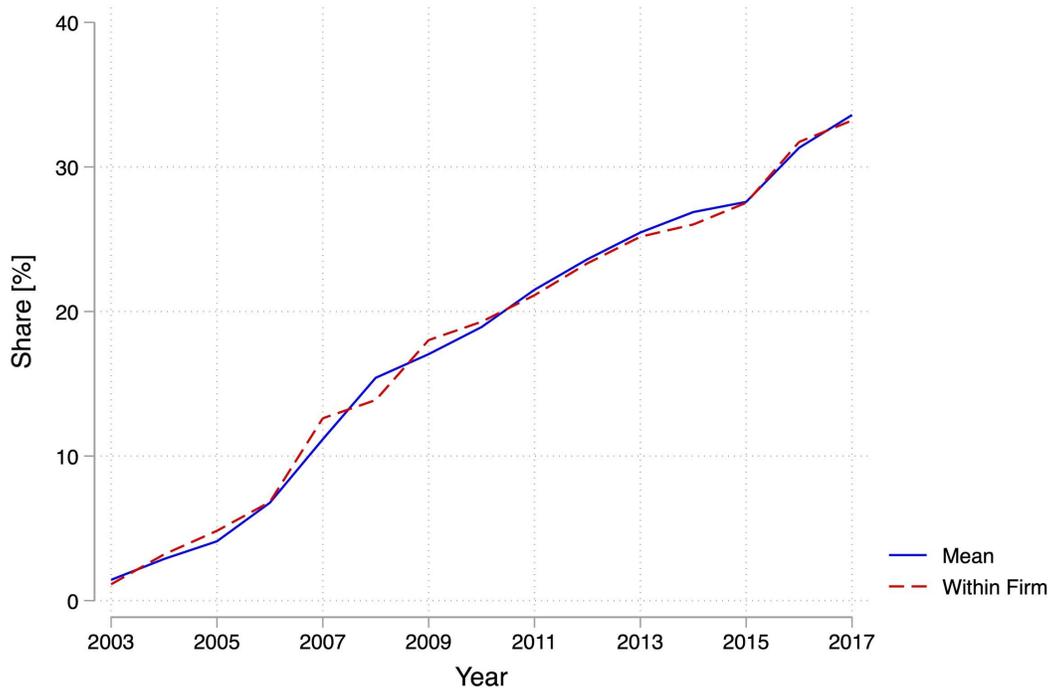


Figure A.15: Proportion offering auto-escalation over time

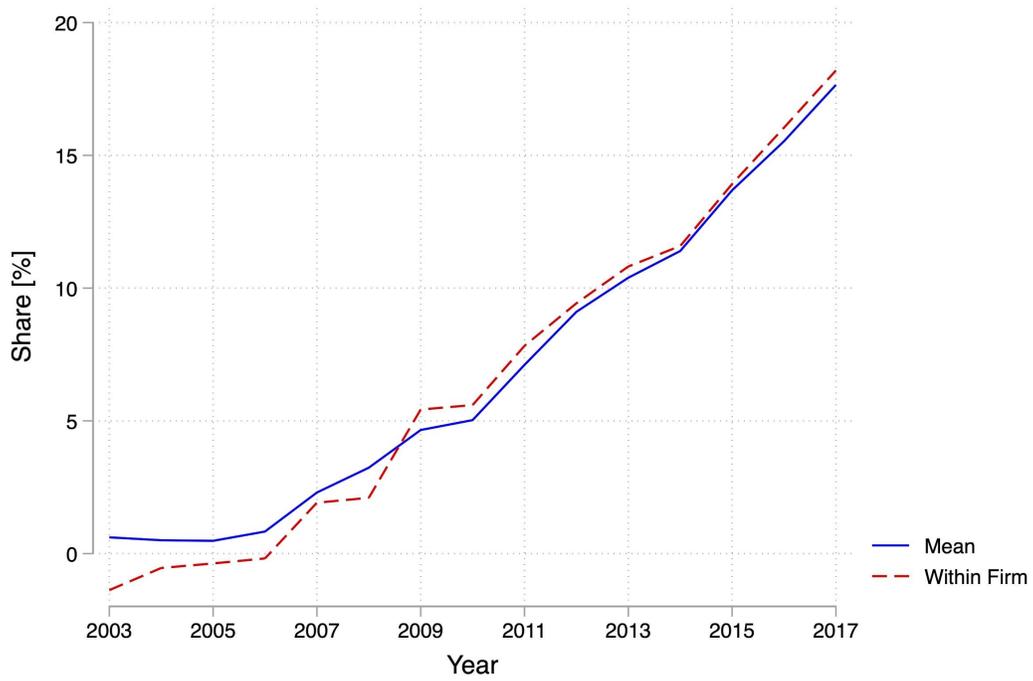


Figure A.16: Average Default Rate - 2003 to 2017

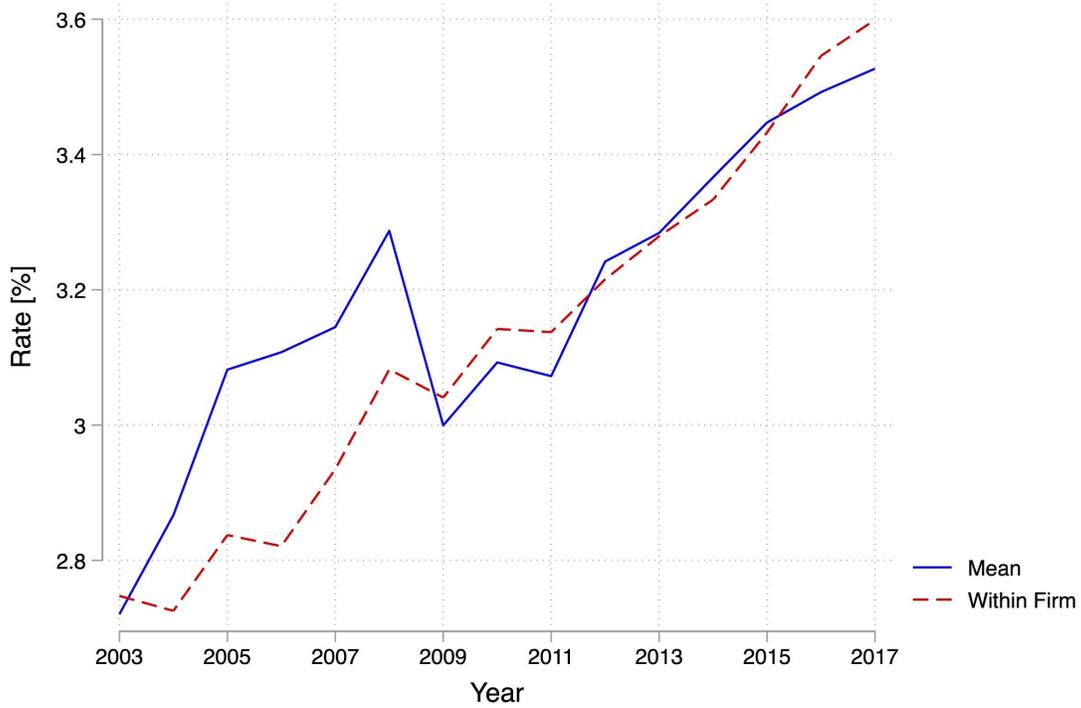


Figure A.17: Distribution of default rate and Relationship between default rates and match caps

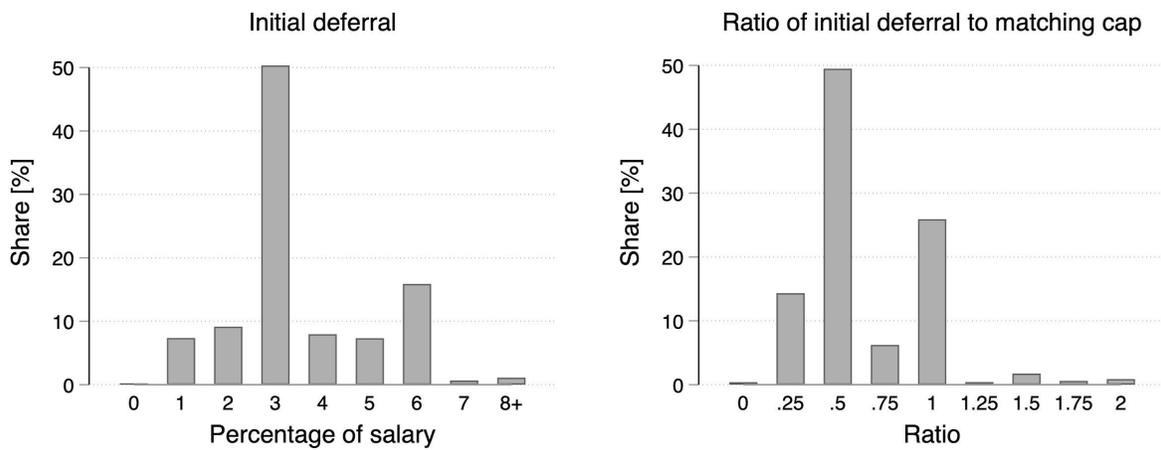
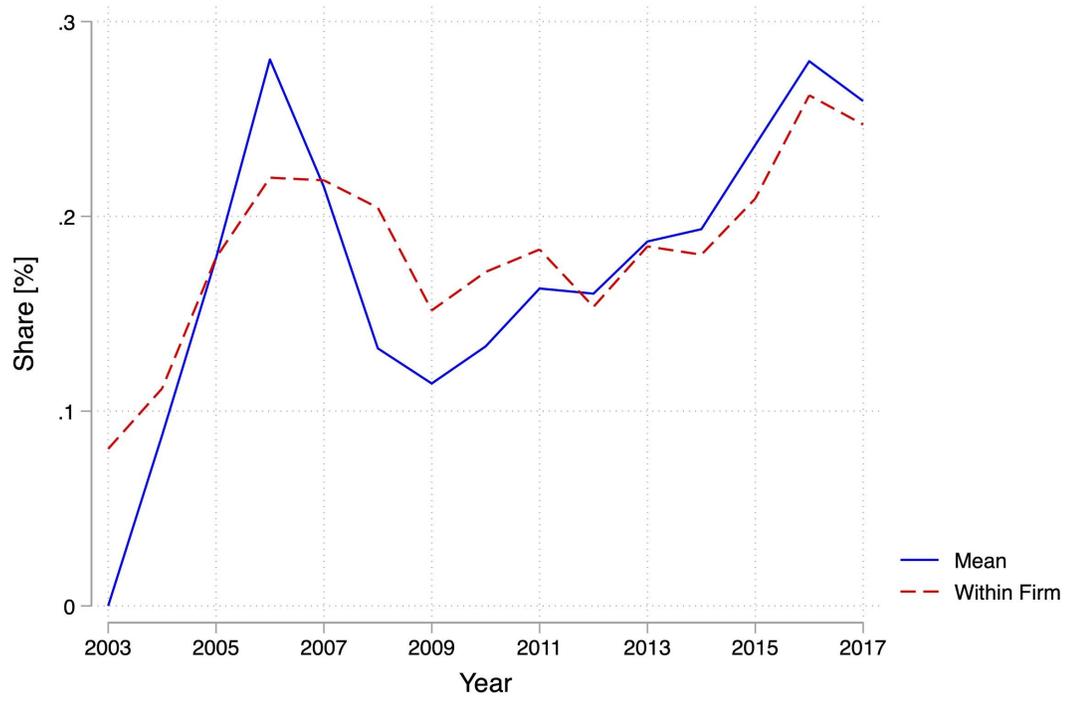


Figure A.18: Time-series fraction of Auto-Enrollment Plans which equated matching cap and auto-enrollment default



Appendix B: Definitions

Matching Schedule

A common feature of employer-provided DC plans is that the employer matches all or some of the contributions an employee makes up to some specified cap. To give an example, the most common ‘match schedule’, as we will see in Section 4 is one that involves the employer matching 50% of the contributions an employee makes up to 6% of the employee’s salary.

Vesting schedule

While employees retain rights to any contributions that they remit into retirement accounts (that is they are immediately ‘vested’), employers retain the right to retain the contributions that they make if the employee leaves employment within a couple of years of starting contributions. For each plan, we collect the ‘vesting schedule’ which gives the rate at which employer contributions vest.

‘Auto-features’

A growing number of plans have ‘auto-enrollment’ - a feature whereby employees become members and have a contribution deducted from their paycheck unless they make an active decision to do no retirement saving. We collect data on whether a plan has auto-enrollment, and what the default contribution is. A smaller, but growing, proportion of plans additionally have auto-escalation, whereby the employee rate of saving increases each year (up to a cap) unless the employee makes an active decision to keep it at its prior level.

Appendix C: Additional Tables

Table C.1.: Average total contributions for employees who fully exploit their matching plan over the sample period

Year	Large Plans		Random Plans	
	Mean [%]	Within Firm [%]	Mean [%]	Within Firm [%]
2003	6.60	6.43	6.37	6.47
2004	6.71	6.57	5.88	5.88
2005	6.81	6.70	5.72	5.83
2006	6.96	6.77	6.00	5.96

2007	7.08	6.89	6.12	6.17
2008	7.07	6.84	7.19	6.91
2009	6.30	6.48	6.05	6.05
2010	6.12	6.37	5.63	5.85
2011	6.52	6.65	6.66	6.72
2012	6.63	6.77	7.21	7.28
2013	6.76	6.85	7.24	7.35
2014	6.89	6.93	7.52	7.47
2015	7.04	7.06	7.40	7.42
2016	7.10	7.12	7.42	7.46
2017	7.20	7.19	7.58	7.47

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