The Effects of Required Minimum Distribution Rules on Withdrawals from Traditional IRAs

We study the effects of Required Minimum Distribution (RMD) rules on the asset decumulation behavior of retirees with Traditional Individual Retirement Arrangements (IRAs). Using a nationally representative panel of 1.8 million IRA holders from 2000 to 2013, we estimate that between 32 to 52 percent of individuals would prefer to withdraw less than their required minimum. However, we also estimate that up to 38 percent of these RMD-constrained individuals did not respond to a temporary suspension of RMD rules in 2009.
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I Introduction

Individual Retirement Arrangements (IRAs) are an important vehicle for retirement savings for a large portion of the U.S. population. In 2015, some 40 million households had at least one IRA (Holden and Schrass, 2016). Total wealth held in IRAs has grown to approximately \$9.5 trillion in 2018, representing one third of total retirement market assets (Investment Company Institute, 2018). Traditional IRAs were created to encourage working-age individuals to save for retirement, allowing savers to delay the taxation of their contributions and earnings accruing within the plans.[1] However, individuals are required to withdraw a certain fraction of the IRA balance each year beginning the year the account holder turns $70\frac{1}{2}$ years of age, with the required fraction increasing with age. We study the effects of these required minimum distribution (RMD) rules on withdrawals from traditional IRAs.

RMD rules reduce the ability of individuals aged $70\frac{1}{2}$ or older to accumulate assets in IRAs. As a result, they limit the extent to which tax-advantaged retirement assets can be passed across generations. The rules also bring tax revenue forward in time, reducing the present-value cost of retirement savings policy. The tax expenditure used to encourage saving through traditional IRAs is substantial – \$17.8 billion in fiscal year 2018 (Joint Committee on Taxation, 2018) – and the RMD rules limit the tax expenditure by mandating distributions, which are taxed as ordinary income. However, as detailed by Warshawsky (1998), the rules were originally designed in 1962 to require distributions from Keogh plans, which are plans for self-employed individuals. While the rules satisfy their original intent, it is unclear whether the current structure is socially optimal given increasing life expectancies and retirement ages.

In general, the welfare implications of RMDs are complex. In order for retirement subsidies for retirement savings to be optimal, such as the tax deferral associated with IRAs, individuals must have some optimization friction or error, such as myopia (CITE). If individuals are myopic and the initial age of RMD onset is sufficiently advanced, RMDs will likely not reduce retirement saving

[1] Roth IRAs are another type of tax preferred retirement savings account. Contributions to Roth accounts are after-tax, but both the earnings and return of contributions are tax free upon withdrawal in retirement.

contributions. This is because RMDs are initially small – roughly equivalent to expected nominal returns in a given year – and because they happen in the distant future, which myopic individuals heavily discount. Instead, for individuals which RMDs are binding constraints, they primarily serve to limit the growth of IRA assets for those in their retirement years, decrease the cost of the tax subsidy, and reduce the amount of assets that can be transferred intergenerationally at the time of the IRA owners death. We find that the rules are indeed binding for many individuals, and also discover an unintended consequences of RMD rules suggesting the fifty year old rules might be out of date.

The rules have remained relatively stable since they were first applied to qualified plans in 1984 and IRAs in 1986. However, the rules were temporarily suspended in 2009 in response to depressed account balances associated with the Great Recession.[2] We use this suspension, as well as changes in RMDs associated with aging, to estimate the effects of RMDs on withdrawal behavior.

The importance of rules governing withdrawals from IRAs will continue to increase. This is due, in large part, to the shifting landscape of retirement savings away from defined benefit plans and toward defined contribution (DC) plans. DC plans are now the most common form of employer-sponsored retirement plan for active private sector workers, whether measured by assets or number of participants (Employee Benefits Security Administration, 2018). However, the effect of this transition is only beginning to appear in the incomes of retirees. Recent work by Bee and Mitchell (2017) shows that income from defined benefit plans are still a more important source of retirement income for the average retiree than income from DC plans and IRAs (combined). It is also increasingly clear that most assets from employer-sponsored defined contribution plans are transferred to IRAs prior to being distributed to the individual (Goodman et al., 2019), making IRAs a *de facto* extension of the DC system.[3] Both of these factors will lead to workers today having larger IRA balances upon retirement, increasing the influence of RMDs and the welfare

[2]The Congressional record from the Senate for December 11, 2008, during debate about the Worker, Retiree, and Employer Recovery Act of 2008 (H.R. 7327), emphasizes that individuals should not be forced to withdraw their savings when the market is down. The bill became law on December 23, 2008 as P.L. 110-458.

[3]Required minimum distribution rules also apply to DC accounts, but as the tax system does not systematically observe DC balances, the effect of RMDs on distributions from DC accounts is largely empirically untested.

costs associated with inefficient policy design.

While a large, established literature studies the effects of retirement policy on the accumulation of retirement savings (Gale and Scholz, 1994; Engen, Gale and Scholz, 1996; Poterba, Venti and Wise, 1996; Madrian and Shea, 2001; Bernheim, 2002; Chetty et al., 2014), a newer, growing literature documents trends in the decumulation of retirement savings (Sabelhaus, 2000; Bershadker and Smith, 2006; French et al., 2006; Love and Smith, 2007; Coile and Milligan, 2009; Poterba, Venti and Wise, 2011, 2013, 2015; Holden and Bass, 2014; Bryant and Gober, 2013; Argento, Bryant and Sabelhaus, 2015). However, few studies analyze the effect of decumulation policies, such as the RMD rules, on withdrawals from retirement accounts. Crucially, a full analysis of optimal retirement savings policy depends on behavioral responses during both working-age *and* retirement-age years. In this paper, we inform the latter.

In one of the only papers to study the RMD rules, Brown, Poterba and Richardson (2017) use proprietary data on roughly 64,000 403(b) accounts at the Teachers Insurance and Annuity Association (TIAA), a large provider of retirement services for employees at nonprofit institutions. In their sample, one in three individuals affected by the rules suspended distributions in 2009. Surprisingly, the probability of suspension did not vary much depending on whether the individual took a distribution equal to their RMD in 2008 (a proxy for being constrained by the rules). Our study makes two contributions relative to Brown et al. First, our tax data are nationally representative, whereas the TIAA sample is not; TIAA plan participants tend to have larger accounts than the national average and we find substantial heterogeneity in responses by account balances.[4] Second, we estimate the effects of the RMD both in the context of the 2009 suspension and in normal, non-suspension years. To estimate these effects we exploit two sources of variation: in addition to the 2009 RMD holiday that Brown et al. study, we use nonlinearities in the RMD schedule during non-suspension years.

[4]While we find that the magnitude of the IRA response to the RMD holiday is similar to that in Brown, Poterba and Richardson (2017), we find a much smaller response on withdrawals from defined contribution plans, of which 403(b)s are one type. Specifically, in related research that is separate from that presented in this paper, we find that defined contribution withdrawals only decreased by 10% in response to the policy change, which suggests substantial heterogeneity in responses among individuals who save with TIAA and other employer plans.

Relative to the retirement savings literature more broadly, we make four contributions. First, we provide descriptive evidence of the characteristics and behavior of retirement-age IRA holders from 2000 through 2013. Second, we use the two sources of variation mentioned in the previous paragraph to identify the age-specific effects of RMD rules on IRA distributions. We estimate two parameters: the elasticity of distributions with respect to the RMD and the proportion of individuals who are RMD constrained – that is, the proportion who would prefer to distribute less than their required minimum. To our knowledge, neither of these parameters have been estimated before. Third, we uncover a previously undocumented extensive margin response (account closures) among individuals newly subject to RMD rules. Finally, we provide evidence consistent with optimization frictions in retirees' financial decisions, analyzing those individuals who were seemingly "constrained" by the inactive RMD rules during the 2009 RMD holiday.

Our results demonstrate that the RMD rules are strongly binding. For every age group subject to the rules, the density of withdrawals from IRA accounts features a sharp spike at the RMD, suggesting that many individuals may prefer to withdraw less. Individual fixed-effects regressions corroborate this evidence. Across a variety of specifications, we estimate elasticities of distributions with respect to RMDs between 0.28 and 0.59. These estimates imply that increasing RMDs by ten percent would cause distributions from IRAs to increase by roughly three to six percent. If one assumes that only individuals who are constrained respond to small changes in RMD rules, then these estimates also imply that between 28 and 59 percent of individuals with IRAs are constrained by the rules.

To further investigate the effects of RMDs, we construct counterfactual distributions of IRA withdrawals that would have occurred in 2009 had the rules not been suspended. We do this separately for each age from 73 to 85, identifying the fraction of RMD-constrained individuals in each group using the technique developed by DiNardo, Fortin and Lemieux (1996). This approach allows us to control for the effects of time-varying characteristics associated with withdrawal behavior – e.g., account balances and alternative sources of income – that changed in 2009 for reasons unrelated to the suspension of RMD rules. This is especially important in our context, as the rules were suspended during the Great Recession.

The results imply that 32% of individuals are constrained by the RMD rules. However, this represents a lower bound on the true number, as optimization frictions (e.g., inattention) appear to have prevented some individuals from responding to the RMD suspension. In 2009, approximately 26% of individuals made a withdrawal within one-half of a percentage point of the "phantom RMD" they would have faced had the rules not been suspended. This is surprisingly large given that an individual's optimal unconstrained distribution is rarely equal to the RMD (Brown, Poterba and Richardson, 2017; Sun and Webb, 2012). Moreover, the 2009 density of withdrawals features a sharp discontinuity at the phantom RMD, rather than the smooth mass of bunchers one would expect if RMDs were coincidentally equal to the typical individual's unconstrained optimal withdrawal. Thus we estimate an additional set of counterfactual histograms for 2009: those that would have prevailed absent frictions. Adjusting for optimization frictions, we estimate that up to 52% of individuals are constrained by RMD rules, with the percentage increasing in age. Of the RMD constrained, up to 38% failed to change their distributions during the suspension year, withdrawing amounts approximately equal to the phantom RMD. The remaining 62% of RMD-constrained individuals took distributions less than the phantom RMD. Consistent with Brown, Poterba and Richardson (2017), 35% of all individuals subject to the rules who took distributions in 2008 suspended distributions in 2009, with the probability of suspension decreasing in age and increasing in account balance. Recognizing the temporary nature of the policy variation that we use for identification here, we expect that under a longer suspension or a permanent removal of the rules there would be less mass at the phantom RMD.

The RMD rules are not designed to force full depletion of the account during retirement. For example, assuming assets held in IRAs generate 4% returns annually, over 70% of the original account balance remains by age 90. Overall, the finding that RMD rules are strongly binding suggests that IRAs are not necessarily used to finance a pattern of smooth consumption. Evidently, most retirees with IRAs would prefer to retain even more of their savings, perhaps for bequest motives or to finance lumpy consumption, such as major surgery or a new roof. However, because we do not observe consumption in our data we cannot test these hypotheses directly. Moreover, while mandatory distributions may nudge retirees to consume, distributed income can always be reinvested in taxable savings vehicles.

Our research can be used to estimate the tax revenue consequences of proposed changes in retirement savings policy. We estimate that the one-year suspension of RMD rules in 2009 led to a decrease in taxable distributions of $22.5 billion in 2009 among individuals who would have been subject to the rules. This policy-induced decrease in distributions resulted in a tax revenue loss of over $5 billion for the 2009 tax year.[5] Our parameter estimates can also be used to study the optimal design of retirement savings tax policy. To the extent retirees would prefer to draw down their assets more slowly, there are adjustment frictions, or there are hassle costs, the current design may not be socially optimal. The effects we uncover pertain to retirement-age responses to policy; however, this behavior matters for the optimal design of savings subsidies targeted at working-age individuals as well. While it is outside the scope of this paper, a valuable avenue for future research is to study whether a different policy design could achieve a similar stream of tax revenue but decrease the aggregate welfare cost associated with the rules. With personal retirement accounts representing an increasingly important source of retirement income, a better understanding of this issue is essential.

II Institutional Background and Data

Here we briefly describe the relevant features of IRAs, including their tax treatment. We then provide a description of our data, including an array of summary statistics related to IRAs and incomes for individuals age 60 or older.

[5]This figure does not account for offsetting positive revenue effects due to higher IRA balances post-2009.

II.A IRAs and Distribution Rules

IRAs offer significant tax advantages to individuals saving for retirement. Several types of IRAs exist, but the vast majority of IRA funds are held in Traditional IRAs. We use the term "IRA" to refer specifically to Traditional, Simplified Employee Pension, and Savings Incentive Match Plan for Employees IRAs throughout the remainder of the paper. The primary benefit of an IRA is tax deferral. When contributed to an IRA, earned income is exempt from taxation until withdrawal, as are any investment returns that accumulate within the account. Distributions from IRAs are taxed as ordinary income. Employer-provided qualified retirement plans, such as 401(k)s, are also subject to RMD rules, but we do not study them because the Internal Revenue Service (IRS) does not systematically collect individual-specific data on these account balances. We also do not analyze withdrawals from Roth IRAs because they are not subject to RMD rules.

RMD rules apply to an IRA holder beginning the year in which she turns $70\frac{1}{2}$ years of age.[6] However, the first year features a grace period; the first required distribution may be delayed until April 1 of the next year. This allows the taxpayer to avoid penalties if she becomes aware of the rules during tax-filing season. For IRAs and defined-contribution plans, the RMD for each year is determined by dividing the account balance at the end of the prior year by an age-specific factor in the Uniform Lifetime Table of IRS Publication 590.[7] This schedule is depicted in Figure 1. It begins at age $70\frac{1}{2}$ with an RMD of approximately 3.7% of account balances, and rises gradually to approximately 8.0% by age 90. The effect of the RMD schedule on account balances is modest, leaving over 30% of the original account balance intact by age 90 if investments generate zero

[6] See Warshawsky (1998) for a thorough discussion of the historical development and intent of the rules.

[7] If an individual has multiple IRAs, distributions from one account may generally be used to satisfy the RMD of another account.

returns, and leaving over 70% by age 90 if investments generate 4% returns annually.[8]

Fiduciaries that serve as trustees of IRAs are required to inform account holders if RMD rules apply to their accounts. In addition, they must either specify the amount of the RMD or offer to calculate it. If an individual does not satisfy his RMD, the penalty is a 50% tax on the undistributed required amount. In practice, however, we find that only around 0.5% of non-compliant individuals file the tax form associated with the penalty (Form 5329).[9]

Under the provision entitled "Pension Provisions Relating to Economic Crisis" of the Worker, Retiree, and Employer Recovery Act of 2008, individuals were not required to take a distribution for 2009 from IRAs or employer-provided defined-contribution retirement plans. The act was passed on December 23, 2008, and presumably was unanticipated by the vast majority of IRA holders. The rule suspension was likely prompted by depressed asset prices due to the financial crisis and accompanying Great Recession. In 2010, the RMD rules were once again in effect.

II.B Nationally Representative 5% Random Sample

We study the effects of RMD rules on IRA distributions using administrative tax data collected by the IRS. These data are well-suited for our purposes for several reasons. First, the data have sufficient mass to allow a detailed view of IRA distributions for narrowly defined bins, such as a given age group with a given level of IRA assets in a given year. Second, tax data suffer from less

[8]A different RMD schedule is used for married individuals whose spouses are more than ten years younger. These individuals follow the Joint Life and Last Survivor Expectancy Table, which specifies a smaller RMD. We incorporate this variation in RMDs for our regression analysis in Section III.B, but when employing the technique of DiNardo, Fortin and Lemieux (1996) in Section III.C we limit our sample of married individuals to those with spousal age differences of ten years or less. This restriction is unlikely to bias our estimates as it results in few observations being dropped – only 3.4% of married individuals – and our regression analysis suggests that RMD rules do not have different effects on the distributions of individuals with spousal age differences greater than ten years.

Inherited IRAs are subject to a separate set of rules. Beneficiaries who are not spouses and who elect to treat the inherited IRA as their own may opt to treat the IRA according to the inheritance-specific RMD rules or to take distributions according to the alternative five-year rule. Under the five-year rule, the entire account must be distributed by the end of the fifth year following the previous owner's death and no distribution is required for any year before the fifth year. Because we do not observe which treatment beneficiaries elect, this introduces some noise into our estimates. In particular, some individuals will appear non-compliant with the Uniform RMD schedule when, in fact, they are subject to alternative RMD rules.

[9]The IRS may waive the penalty if the failure to satisfy the RMD was due to reasonable error and steps were taken to remedy the violation.

measurement error than most survey data. Third, the data allow us to construct a nationally representative profile of individuals' IRAs, as opposed to being limited to a single fiduciary. Fourth, tax data include a variety of information on income (including other asset-based income) and household structure. Finally, the data can be organized as a panel, allowing for analysis of changes in distribution patterns for a given individual over time.

The primary dataset used in this study is a 5% random sample drawn from the population of individuals in the United States with an identification number recorded by the Social Security Administration (SSA) who are not known to be deceased by SSA. Our sampling method is based on a pseudo-random individual-specific identifier generated by IRS.

The base sample – hereafter, the "5% Sample" – is limited to individuals age 60 or older from 2000 to 2013. An observation is an individual-year combination. We impose the following sample restrictions. First, individuals with no tax returns or information returns in any year are dropped.[10] Second, observations are dropped if the individual dies in the current year or the following year.[11] This restriction causes our sample to under-count the resident population, but reduces the effect of end-of-life decisions on our empirical estimates.

The 5% Sample is organized as a panel and is balanced for individuals alive and 60 or older in every year of our sample and unbalanced for those who die or age into our sample during the sampling period. We prefer this sampling structure to a purely balanced panel, as the data better approximate the U.S. population age 60 or older in every year. We supplement these data with information from the SSA on dates of birth and death, as well as sex at the time of birth.

Information returns are individual specific and are typically filed by third parties such as fiduciaries or employers. We use the following information returns: Form 5498, Form 1099-R, Form 1099-SSA, Form W-2, Form 8606, Form 1099-INT, Form 1099-DIV, and Form 5329. From these we observe IRA balances, contributions, distributions, and other income information. Individuals may receive multiple information returns of a given type, but we collapse the data to one observa-

[10]This restriction results in roughly 350,000 individuals being dropped, though many of these individuals are likely deceased. The sample remains representative of the national population despite this restriction (Cilke, 2014).

[11]Approximately 30% of individuals die at some point during the fourteen-year sample period.

tion per individual-year, summing and counting relevant variables. Importantly, these forms are not limited to those individuals appearing on a tax return, though most individuals who have an IRA do appear on a tax return. For them, we observe additional variables, including self-employment income, deductions, and credits.

We make two additional restrictions to the 5% Sample. First, we limit the data to the years 2000 through 2013. While we have data from 1999, we exclude 1999 as a sample year because an individual's RMD in 1999 is based on the fair market value of his IRA balance at the end of 1998, which we do not observe. Second, we drop the top 1% of distributions measured as a percentage of the previous year's account balance (more than 103%). Many of these distributions are implausibly large and are likely the result of data errors.

For most of our empirical analysis, we use a sample further limited to individuals with a positive IRA balance in at least one year. We refer to this as the "IRA Holders Sample".[12] We also refer to the "RMD Sample", which is the subset of individuals in the IRA Holders Sample age $70\frac{1}{2}$ or older with a positive RMD for the observation year (including 2009).[13]

II.C Summary Statistics

Table 1 presents a variety of summary statistics for the 5%, IRA Holders, and RMD Samples in the most recent year we can present statistics for all variables, 2013. We only show data from one year so that each individual in the sample is weighted equally. In an online appendix, we present summary statistics from all years, which necessarily gives greater weight to individuals with more observations (e.g., those who live longer). In 2013, the 5% Sample contains 3.2 million observations. Seventy-three percent of individuals appear on a Form 1040 as a primary or secondary filer,

[12]Note that a person-year observation in the IRA Holders Sample may or may not have a positive IRA balance in that year.

[13]We make two additional timing-related restrictions in our construction of the RMD Sample. First, we exclude individuals in their second year of being subject to RMD rules for the year 2000. That is, we exclude individuals who turn 71 during 2000 if their birth month is January-June and individuals who turn 72 during 2000 if their birth month is July-December. We do this because we cannot determine whether these individuals satisfied their first-year RMD in 1999. Second, we exclude individuals who are first subject to RMD rules in 2013 because we cannot determine whether they satisfy their first RMD by April 2014.

39% have a Form 5498 filed on their behalf, and 54% receive a 1099-R. Further, 27% have a Form 1099-DIV, 41% have a Form 1099-INT, and 30% have a Form W-2.

We observe marital status for individuals filing a tax return. Conditional on filing, 67% of individuals in 2013 are married. However, 27% of observations are associated with a non-filing individual. For these observations, we impute marital status and spousal age difference based on tax returns from previous and future years.[14] Using imputed marital status, we find that 61% of individuals in 2013 are married.

Thirty-seven percent of individuals ages 60 and older have an IRA in 2013. The average account balance for this group is $184,850 in inflation-adjusted 2014 dollars, and there is substantial variation in balances, with the distribution exhibiting a long right tail. We focus on withdrawals from IRAs categorized by the IRS as "normal distributions," defined as those distributions that can be used to satisfy RMD rules (regardless of whether an individual is subject to RMD rules). Normal distributions in this context – not to be confused with a Gaussian probability distribution – exclude distributions associated with rollovers, Roth conversions, recharacterizations, disability- or inheritance-related distributions, distributions from a Designated Roth account, or those from IRAs that have been structured to have annuity payments.[15] For brevity and to avoid confusion, we refer to normal distributions simply as "distributions" throughout this paper. In the IRA Holders Sample, 46% of individuals take such distributions in 2013, and the average distribution is $14,560 in inflation-adjusted 2014 dollars, or about 14% of the account balance.

In 2013, 3.7% of IRA holders close (all of) their IRA account(s). Throughout the paper, we take the term "account closure" to exclude consolidation of multiple accounts. We find no evidence that account-closing distributions are more likely to be Roth conversions for $70\frac{1}{2}$-year-olds. Thus account-closing distributions appear to reflect true extensive margin responses rather than shifting

[14]If an individual filed a tax return in a previous or later year, we use their marital status and spousal age difference from the nearest year, provided that the spouse is alive in the current year. If the spouse is deceased in the current year, we do not impute a marital status for that year. We do not have an imputed marital status for the 8.7% of individuals who do not file in any sampled year. Instead, we calculate their RMD based on the Uniform Lifetime Table, which is the RMD schedule used for over 96% of observations for which we know the marital status and spousal age difference from the Form 1040.

[15]Because we exclude distributions from IRA annuities, we slightly undercount the population that satisfies the RMD rules. However, distributions from IRA annuities comprise less than 0.1% of all distributions.

across different types of tax-preferred retirement savings accounts. The average size of an account-closing distribution in 2013 is $56,158 in inflation-adjusted 2014 dollars.

In our RMD Sample, the average RMD in 2013 is $7,733 in inflation-adjusted 2014 dollars, or approximately 5.2% of the balance. The size of the average distribution is 14% of the account balance for the entire sample in 2013 and 11% among individuals in the RMD Sample. Among individuals in their $70\frac{1}{2}$th year, over 84% take their first RMD that year rather than postponing to the next year. This is potentially for tax-smoothing reasons: if an individual postpones their first RMD, they are responsible for taking both their first and second RMDs in that year and both are included in taxable income.

Ninety percent of individuals in the RMD Sample take a distribution that satisfies their RMD in 2013. Among individuals who fail to satisfy their RMD, a negligible fraction file Form 5329, which indicates payment of the relevant excise tax penalty. Because we are using pre-audit administrative tax data, it is likely that the fraction of people who ultimately satisfy their RMD is higher than 90%. However, some portion of the 10% gap could be due to non-compliance – either deliberate tax evasion or merely inattention. Age trends are more consistent with the latter explanation: the average percentage of individuals that satisfy their RMD is above 90% until age 85, after which it declines substantially, falling to just over 80% at age 90 and continuing to fall thereafter.[16] Few individuals are repeat non-compliers. For any two year combination, only 2 to 3% of individuals do not comply in both years.

Account balances also display a clear pattern by age, as shown in Figure 2. Balances increase on average and for each quartile as individuals approach age $70\frac{1}{2}$. Once RMD rules apply, balances begin declining at a decreasing rate. The figure also highlights the skewness of the distribution of IRA assets, as at all ages the mean IRA balance lies near the 75th percentile.

Our data also reveal the increasing importance of IRAs as a savings vehicle for older Americans. The percentage of individuals age 60 or older with an IRA steadily increased from 29% in 2000 to 35% 2013. The percentage with Roth IRAs increased during this period as well, from

[16] This pattern can be seen in Figure A2 in Online Appendix C.

around 0% in 2000 to 7% in 2013. Wealth stored in retirees' IRAs grew even faster over this period: total assets held in IRAs have more than doubled in real terms since 2000, increasing from $1.9 trillion to approximately $3.8 trillion in 2013 (measured in 2014 dollars). Assets held in Roth IRAs also increased substantially relative to 2000 levels, but remain small relative to IRA assets.

The Great Recession was associated with a substantial decrease in balances in 2009, and, as Figure 3 shows, by 2013 average balances had not yet returned to their 2008 levels. Median account balances, on the other hand, rebounded more quickly, as did the 75th percentile (and, to a lesser extent, the 25th percentile). Figure 3 again highlights the substantial right-skewness of the distribution of IRA balances. Withdrawals, depicted in Figure 4, are skewed even more, with means lying substantially above the 75th percentile in all years. The figure also shows that mean, median, and 75th percentile distributions from IRAs all decreased in 2009, with the median falling to zero as many individuals suspended distributions altogether.

III Empirical Methods and Evidence

In this section, we present results from several analyses of IRA decumulation. First, we present descriptive graphical evidence of the effects of RMD rules on distributions. Next, we discuss two empirical strategies used to estimate effects of RMD policy: reduced-form regressions and the estimation of counterfactual histograms of IRA distributions. We then discuss the effect the rules have on account closure at age $70\frac{1}{2}$.[17]

III.A Graphical Evidence of the Effect of the RMD Rules

Figure 5 shows that many individuals take withdrawals from their IRA approximately equal to (within a half percentage point of) their RMD. The figure shows the percentage of such RMD

[17] See Online Appendix Figure A12 and Tables A3 and A4 for characteristics of those taking distributions near the "phantom" RMD in 2009 and those who persistently take distributions equal to their RMD. In general, those individuals that suspended distributions or took distributions below the suspended RMD level in 2009 had more income. Similarly, those that consistently take distributions equal to their RMD tend to have higher incomes.

takers by age group and by account balance ventile (i.e., twenty equally sized bins by account balance). Across all age groups, the bottom ventile, with account balances below $3,500 in 2014 dollars, sees between 35 and 55 percent of individuals withdrawing the RMD. As we will see in Section III.E, these individuals are more likely to withdraw their entire account balance when first subject to RMDs. At all other account sizes, all age groups are significantly more likely to withdraw the RMD. The youngest group subject to RMD rules, ages 70 to 74, generally sees between 45 to 60 percent of individuals withdrawing the RMD amount. In the oldest group, ages 85 to 100, between 60 to 70 percent of individuals withdraw the RMD. Overall, this provides *prima facie* evidence that many individuals are constrained by RMDs.

Figures 6 and 7 provide further evidence of the effects of RMDs, spotlighting the introduction of RMDs at age $70\frac{1}{2}$. They show the fraction of individuals who make withdrawals and the average size of withdrawals for the years 2008-2010. Approximately 25% of individuals younger than $70\frac{1}{2}$ take a distribution in any year, with an average distribution of 6.2% of IRA balances withdrawn. The fraction of individuals who take a distribution increases linearly from age 60 to 70. In non-2009 years, the proportion of individuals within an age group who take a distribution increases to over 90% for $70\frac{1}{2}$-year-olds. The average size of distributions jumps by 76% to 10.9% of the account balance for $70\frac{1}{2}$-year-olds, with a 13.1% average among all individuals subject to RMD rules.

The RMD suspension in 2009 had a large effect on decumulation behavior. The fraction of individuals age $70\frac{1}{2}$ in 2009 with a distribution is only 60%, compared to over 90% in non-suspension years, and the average distribution fell by roughly 25% from 10.9% of the IRA balance to 8.2%. However, distributions in 2009 among $70\frac{1}{2}$-year-olds were much larger than distributions among 70-year-olds and younger, who are not subject to the rules. Similarly, the proportion of individuals age $70\frac{1}{2}$ with a distribution from a traditional IRA in 2009 was roughly 32% larger than the proportion of younger individuals with distributions. As discussed further in Section III.D, this large, discrete jump in 2009 in the proportion taking distributions and the size of distributions at age $70\frac{1}{2}$ is suggestive of optimization frictions associated with the RMD rules, such as inattention or the use of heuristics.

As shown in Figure 8, distribution patterns in 2009 also differ from 2008 and 2010 when examining individuals with positive distributions. Measured as a percentage of account balances, distributions are elevated in 2009 for those affected by the RMD suspension. However, recall that Figure 4 implied distributions fell in 2009 when measured in levels. Taken together, the evidence indicates that those individuals who took distributions in 2009 partially offset the impact of falling asset prices by withdrawing a larger share of their balances.

Figure 9 displays the histograms of IRA distributions among 73-year-olds from 2005 to 2008. Each histogram is a normalized frequency of IRA distributions, measured as a percentage of the account balance in the previous year, with distributions rounded to the nearest 0.05th of a percentage point.[18] We limit the histograms to distributions between 0% and 8% of account balances, as the tail to the right of the RMD is long and uneventful. In addition, we focus on age 73 as this is the first age where the RMD threshold is not complicated by the grace period at the onset of RMD rules. The results for older age groups are similar.[19]

Two aspects of the histograms are noteworthy. First, they are remarkably consistent. Indeed, it is nearly impossible to visually differentiate between histograms associated with different years. Second, the histograms emphasize the bimodal nature of IRA distributions, with substantial mass only at zero and the RMD (4.05% for 73-year-olds).

Distributions changed significantly in 2009 – the year RMDs were suspended – relative to 2008, as shown in Figure 10. Once again, the action revolves around two points, with a large mass shifting from the RMD in 2008 to zero in 2009.[20] This again provides *prima facie* evidence that a large fraction of individuals find the RMD to be a binding constraint. In addition, we see a nontrivial mass remain at the RMD in 2009. One potential explanation is that perhaps the phantom RMD reflects the unconstrained optimal withdrawal for many IRA holders. However, if this were the

[18] We use normalized histograms (frequencies) instead of densities because kernel density estimators result in too much mass at distribution levels immediately to the left and right of the RMD, where the mass exhibits a large discontinuous jump.

[19] See Online Appendix C for the entire histograms for 73-, 75-, 80-, and 85-year-olds.

[20] See Online Appendix C for analogous figures for 75-, 80-, and 85-year-olds.

case, one would expect a smooth mass of bunching at and around the phantom RMD. Instead, we see a sharp discontinuity in withdrawals precisely at the phantom RMD, suggesting optimization frictions dampened the response to the policy change.

Of course, IRA distributions might have been different in 2009 regardless of the RMD suspension, due to macroeconomic factors. Thus the above analysis cannot identify the effects of RMD policy, though it is certainly suggestive of non-trivial effect sizes. The potential issue of macroeconomic confounders motivates the empirical approach in Sections III.B and III.C; however, Figures 7 and 8 provide some evidence that macroeconomic conditions may be unimportant. In the figures, there is little change in distributions among individuals younger than $70\frac{1}{2}$ – who were not affected by the RMD suspension – between the years 2008 and 2010. Moreover, the Great Recession likely had an even smaller impact on older retirees, who were presumably invested in less risky assets.[21]

III.B Reduced-Form Estimation

In this section, we discuss results from regression analyses of individuals age $70\frac{1}{2}$ to 90 with a non-zero account balance (the RMD Sample). The following regression equation captures the effects of changes in the (natural log of the) required distribution RMD_{it} on (the natural log of) IRA distributions d_{it}:

$$ln(d_{it}) = \alpha_0 + \alpha_{1t} + \alpha_{2i} + \alpha_3 * ln(RMD_{it}) + \alpha_4 X_{it} + \epsilon_{it}, \quad (1)$$

where the i and t subscripts denote individuals and years, respectively, α_0 is a constant term, α_{1t} are year fixed effects, α_{2i} are individual fixed effects, and X_{it} represents a vector of time-varying individual characteristics. Specifically, X_{it} includes indicators for marital status and the first and second years one is subject to RMDs as well as variables that determine an individual's RMD: the natural log of the IRA balance and indicators for age and whether an individual is more than 10 years older than their spouse. The year fixed effects control for any determinants of distributions

[21] Indeed, we find that account balances declined less on average for older individuals during the Great Recession.

that are common to all individuals, including macroeconomic conditions. The age fixed effects control for any determinants that are common to all individuals who are the same age, for example, a decreased remaining life span. Individual fixed effects control for any unobserved, time-invariant heterogeneity in determinants of distributions, such as savings preferences, household resources, idiosyncratic life expectancies, medical expense uncertainty, and risk preferences. The parameter ϵ_{it} is an unobserved additive error term that represents sampling error or unobserved, time-varying heterogeneity at the individual-year level in determinants of IRA distributions. We allow for the errors to be correlated at the individual level. We use a log-log specification because the distributions of IRA balances and withdrawals exhibit long right tails. We limit the sample to those between the ages of 61 and 90 (inclusive).

The coefficient of interest is α_3, which represents the elasticity of distributions with respect to the RMD. It measures the percent change in distributions associated with a one percent change in the RMD. If RMDs only affect those who are constrained by them – and therefore there are no spillover effects on distributions above the RMD or heuristic effects whereby people use RMDs as advice – then α_3 also captures the fraction of individuals who are RMD constrained. For example, a coefficient of one would indicate that all individuals are RMD constrained, while a coefficient of $1/2$ would indicate that half of individuals are RMD constrained. This is because the elasticity for RMD-constrained individuals is one, as their distributions increase in lockstep with RMDs. We can identify α_3 because the individual-level RMD is exogenous after controlling for the variables that determine it.

The variation that identifies α_3 comes from two sources. The first is heterogeneity in account balances (and therefore RMDs) within age groups and within individuals across time. This interacts with the RMD schedule, which is relatively stable and known to retirees well in advance, to produce somewhat predictable variation in RMD levels faced by individuals. The second source of identifying variation comes from the unexpected 2009 RMD suspension. The 2009 policy suspension did not go into effect until December 23, 2008 and it is unlikely that distributions in any year prior to 2009 were affected. Because an expected change in the RMD may have different effects from an unexpected change, we separately run the above regression for two samples: one which includes all years, and one which excludes 2009.

Table 2 shows the regression results for Equation 1. The first column shows results for all years and therefore captures responsiveness to both expected and unexpected changes in RMDs. Consistent with our graphical evidence, the regression estimates indicate that the RMD rules have a substantial effect on IRA distributions. Column 1 shows the estimated coefficient on the natural log of the RMD of 0.56, indicating that a 10% increase in the RMD causes a 5.6% increase in IRA distributions. On average, married individuals have larger distributions, as do individuals with spouses ten or more years younger. Account size and distributions exhibit a strong relationship: the estimates in Column 1 suggest that a 10% increase in IRA balance is associated with a 4.6% increase in distributions, holding RMDs constant. However, because all of the non-RMD covariates are endogenous, we cannot attribute causality to the estimated coefficients associated with them.

The second column presents results after dropping observations from 2009. The elasticity of withdrawals with respect to RMDs falls modestly to 0.49, indicating that IRA holders were more responsive to 2009's large, unanticipated change in RMDs relative to other years' smaller, anticipated variation. However, both specifications (columns 1 and 2) show that individuals in their first or second year of being subject to RMDs behave rather differently. In particular, in their first year, individuals withdraw around 49 percent less on average across all years, *ceteris paribus*. In columns 3 and 4 we re-run the regressions of columns 1 and 2 after dropping individuals ages 70 to 72, thus keeping only individuals for whom the RMD is measured accurately and is legally binding.

Column 3 reports results for all years after excluding those ages 70 to 72, and the elasticity measured in this sample (0.59) is similar to that without the age restriction (0.56). However, column 4 removes the 2009 variation from this specification and sees the elasticity fall dramatically to 0.28. This indicates that a significant portion of the responsiveness measured in column 2 is derived from individuals who have only recently become subject to RMD rules and for whom a grace period applies.

Columns 5 and 6 provide further robustness checks against the specifications of columns 1 and 2. In particular, in the first four columns, we add one to variables when taking natural logarithms. In the last two, we add 1,000 instead. This places relatively more weight on intensive margin responses to RMDs relative to extensive margin responses. In column 5 we see that this reduces the RMD elasticity somewhat relative to column 1; however, in column 6 we see that the RMD elasticity is now larger relative to column 2. This is consistent with greater extensive margin responsiveness to the 2009 policy variation relative to non-2009 RMD variation. This concords with intuition, as many individuals suspended distributions altogether in 2009, while few individuals subject to RMD rules withdraw zero in non-2009 years.

The information contained in these regression estimates suggest that between 28 and 59 percent of individuals are RMD constrained. They also suggest greater extensive-margin responsiveness, but lesser intensive-margin responsiveness, to RMDs in 2009 relative to other years. In the next section, we estimate the fraction of RMD-constrained individuals more precisely and examine how it varies by age.

III.C Counterfactual Histograms of IRA Distributions

The estimating equations discussed in the previous section are confined to studying the average effect of RMDs on IRA distributions. In this section, we present evidence of the effect of RMDs on the entire density of IRA distributions. To motivate our analysis, consider Figures 9 and 10, which show the histograms of IRA distributions among 73-year-olds from 2005-2008 and 2008-2009, respectively. In years other than 2009, the histograms are strikingly consistent. In contrast, Figure 10 shows substantially different histograms of IRA distributions in 2009. This suggests that current RMD policy affects the density of IRA distributions at or below the RMD, and that a large fraction of individuals are RMD constrained.

To precisely estimate the proportion of individuals who are RMD constrained, we compare observed histograms of IRA distributions in 2009 with counterfactual histograms assuming the rules had not been suspended. We construct these counterfactuals using a technique developed by Di-

Nardo, Fortin, and Lemieux (1996), hereafter referred to as "DFL." This method divides the 2009 histogram for a given age group into two regions. Above the RMD, we assume distributions are not affected by the RMD suspension, and use the observed 2009 histogram. Below the RMD, we estimate the counterfactual histogram using an observed histogram from a non-suspension year.[22] For concreteness, suppose we are using the 2008 histogram as the basis for our counterfactual for a particular age group. One option would be to simply superimpose the 2008 histogram as is. However, this is problematic because the variables that affect distribution decisions may have differed in 2008 and 2009. For example, the ongoing recession reduced account balances, which may partially determine the histogram of distributions.

The DFL method, described in detail in Online Appendix B, addresses this issue directly. Intuitively, the method takes the observed histogram of 2008 and re-weights it to account for the different distribution of covariates in 2009. These covariates include sex at the time of birth, imputed marital status, a quartic of the previous year account balance, Social Security benefits, wage income, taxable pension benefits, and income from interest, dividends, and capital gains.[23] Within a single age group, we use the DFL method only on the subsample of individuals who are subject to the same RMD, given by the Uniform Lifetime Table. The histograms are normalized frequencies of IRA distributions, measured as a percentage of the account balance, with distributions and the RMD rounded to the nearest fifth of a percentage point.

Figure 11 shows the 2009 actual and counterfactual histograms for 73-year-olds using 2008 as the baseline year. The actual histogram (blue dots) is displayed with the estimated counterfactual histogram (green line) that would have prevailed if the RMD rules had not been suspended in 2009, holding individual characteristics at 2009 levels. The RMD for 73-year-olds is marked by a vertical line at 4.0%. We limit the horizontal axis to distributions that are 8% of the account balance or less (approximately 80% of the total mass) because this is where the differences between actual and

[22] In the empirical implementation we use the RMD plus half of a percentage point (e.g. 4.55 for 73-year-olds) as the cutoff because of the abnormal concentration of distributions immediately above the actual RMD, which suggests either small spillover effects or rounding.

[23] We also explored including the effect of median housing prices at the zip-code level. The results for the subsample with this data are similar to those for the entire sample and are available on request.

counterfactual histograms are located.

The results confirm that a large fraction of individuals is affected by RMD rules. The shift in mass from the RMD to zero in Figure 11 is consistent with the 2009 RMD suspension inducing many individuals to suspend their distributions. Table 3 reports the differences between the 2009 actual and counterfactual histograms for 73-year-olds and other age groups at two points: zero and the level of the 2008 RMD. For example, among 73-year-olds, 34% of individuals would have taken a distribution equal to the RMD in 2009 had the rules remained in effect, but instead took out a different distribution in 2009. This displaced mass is accounted for by the 35% of individuals who took no distribution in 2009 although they would have taken a distribution had the rules been in effect. The table reveals significant heterogeneity across ages in the difference between the observed and counterfactual histograms. As individuals age, less mass is displaced from the 2009 RMD. Among 85-year-olds, for example, only 28% of individuals were displaced from the RMD. Overall, the weighted average of the fraction displaced from the RMD is 32%.[24]

These results initially appear at odds with the regression results presented in Section III.B. When we include the 2009 RMD suspension in regression analysis, the elasticity estimates imply that between 50 to 59 percent of individuals are RMD constrained. Here we find that only 32% of individuals were displaced from the RMD in 2009. There are three mutually compatible explanations for this. One is that the regression identifies the response to RMDs in all years of our sample, not merely 2009, and therefore the different estimates may be due to temporal variation in the fraction constrained by RMDs. Another explanation is that the regression estimates only identify the fraction of individuals who are RMD constrained if there are no spillover effects of RMD policy on distributions above the RMD. To the extent that unconstrained individuals are influenced by the RMD, the regression parameter captures this effect as well. This is plausible given survey evidence from Brown, Poterba and Richardson (2017); half of the 403(b) participants in their sample agreed that a "required minimum distribution [provides] some guidance on how much you can spend each year for the rest of your life without running out of money."

[24]The DFL results are robust to age, choice of baseline year, and RMD threshold choices. See Online Appendix C for more detail.

The third potential explanation for the discrepancy in results is that optimization frictions – such as the costs of paying attention and re-optimizing withdrawal decisions – moderated the response to the RMD suspension. As Figure 10 shows, the observed pattern of distributions retains a sharp spike in 2009 precisely at the "phantom RMD" – that is, the RMD that would have applied had the rules been active. This behavior implies that our DFL estimate of 32% represents a lower bound on the fraction of individuals truly constrained by RMD rules. In the following section, we place an upper bound on this proportion by explicitly taking frictions into account.

III.D Optimization Frictions in 2009

As we have seen, when the RMD rules were suspended in 2009, many individuals nonetheless took distributions equal to the phantom RMD. This behavior suggests that for many individuals optimization frictions prevented a response to the rule change. The nature of these frictions is unclear, however. Perhaps individuals were unaware of the rule change, consistent with the survey evidence of Brown, Poterba and Richardson (2017), as 45% of their sample either did not know about or did not remember the temporary suspension. Brown et al.'s survey evidence is also consistent with individuals using the RMD as a heuristic for optimal decumulation, as half of their sample reported that RMDs provide financial guidance. In addition, individuals may have been willing to tolerate small losses in utility in order to avoid the cognitive costs of re-optimizing their withdrawal strategies, as in Chetty (2012) and Gelber, Jones and Sacks (2015).[25]

The fraction of individuals ages 73 to 85 who took distributions within one half of a percentage point of their phantom RMD in 2009 is around 26%. However, not all such individuals were af-

[25] We have modest evidence that information plays a role in whether individuals suspended distributions or withdrew an amount equal to their phantom RMD. At the beginning of each year, fiduciaries are required to send Form 5498 to IRA holders. This form has a box indicating whether an RMD applies in that year, among other information. In a typical non-suspension year, 84% of individuals who are subject to the RMD rules have a checked box, while in 2009 (on the 2008 Form 5498), 46% of individuals had a checked box, despite the RMD suspension. That these numbers are not one hundred and zero percent, respectively, indicates a lack of compliance on the part of fiduciaries. We find that 46.7% of individuals who withdrew an amount equal to the phantom RMD had the box checked, compared to 45.4% of individuals who withdrew nothing or some other amount. As expected, individuals who made withdrawals close to their phantom RMD were more likely to receive incorrect information. However, the difference is small, suggesting that individuals do not pay close attention to this particular piece of information.

fected by frictions. Some would have taken distributions in this range even in a frictionless world. To place an upper bound on the fraction of individuals who are affected by frictions, we estimate a "frictionless" histogram of distributions near the phantom RMD using a technique developed by Chetty et al. (2011) in the context of income bunching at kinks in tax schedules. First, we predict the histogram at the phantom RMD by fitting a seven-degree polynomial using the observed histogram away from the phantom RMD. Specifically, we group distributions into 0.05 percentage point bins, and we use the observed histogram in bins between 0.5 percentage points and 8 percentage points, excluding bins within 0.5 percentage points from the phantom RMD. This provides an estimate of what the counterfactual histogram of distributions would be if the excess mass at the phantom RMD were removed from the population. We then distribute the excess mass uniformly between 0.5 percentage points and the phantom RMD minus 0.05 percentage points.

The results of our method can be seen in Figure 12, shown with bin widths of 0.2 percentage points. We depict the observed histogram (blue dots) and frictionless counterfactual (green line) for 73-year-olds here, with those pertaining to 75-, 80-, and 85-year-olds presented in Online Appendix C. To the right of the phantom RMD, the counterfactual histograms are identical to the observed histograms. To the left of the phantom RMD, the counterfactual histograms are elevated to accommodate the mass affected by frictions. This counterfactual overestimates the number of individuals affected by frictions if some portion of the excess mass near the phantom RMD in 2009 corresponded to individuals who were near their unconstrained optimum withdrawal.

Table 4 reports our findings for all age groups between 73 and 85. Our estimates imply that 20% of these individuals were affected by frictions in 2009. This places an upper bound on the proportion of individuals who would have taken a substantially different IRA distribution had they been fully informed of the RMD suspension and easily able to respond to it. The implied fraction of individuals affected by frictions increases with age. For those age 73, our estimates suggest that 15% were affected by frictions. For those age 85, the figure is 26%. Taking into account our sampling probability, we estimate that up to 1.2 million individuals between the ages of 73 and 85 were affected by optimization frictions when they chose their IRA distributions in 2009.[26]

In the previous section, we estimated that 32% of individuals ages 73 to 85 were displaced from the RMD in 2009. In addition, here we have estimated that up to 20% remained at the phantom RMD despite the rules suspension due to optimization frictions. Combining these figures, the DFL estimates imply that between 32% and 52% of individuals are constrained by the RMD rules. The upper end of this range represents our best estimate, for two reasons. First, it is consistent with the regression evidence of Section III.B, which implies that between 50 to 59 percent of individuals are RMD constrained in the specifications that include the 2009 RMD suspension. Second, it is consistent with the fact that histograms of distributions taken by individuals who are ages 68, 69, and 70 (and who are not subject to RMD rules) do not exhibit elevated mass anywhere other than at zero.[27]

III.E Effect of RMDs on Account Closure

Thus far we have seen evidence consistent with optimization frictions in the context of changes to RMD policy. Here we document evidence consistent with frictions in the context of *stable* RMD policy. In particular, suppose there are adjustment costs associated with responding to the RMD rules. In this case, when individuals turn age $70\frac{1}{2}$, they must weigh the tax benefits of maintaining an IRA against the costs of adhering to RMD rules. If the costs exceed the benefits, individuals will close their IRAs. To the extent that compliance costs are non-trivial, the data should reveal a sharp increase in IRA closures at age $70\frac{1}{2}$ relative to similar ages above and below $70\frac{1}{2}$. We expect the likelihood of account closure is decreasing in account balance, as the tax deferral benefits are likely an increasing function of account size, while compliance costs are approximately fixed.

To gauge the effect of RMD rules on account closure, we estimate the following logistic re-

[26] We expect that if the RMD rules were permanently removed, the excess mass at the phantom RMD would gradually disappear. In their study of optimization frictions, Gelber, Jones and Sacks (2015) find that Social Security recipients adjust earnings slowly when incentives to bunch at kink points are removed.

[27] See Figure A13 in Online Appendix C.

gression for twenty separate subsamples divided by IRA account balance ventiles:

$$close_{it} = \alpha + \alpha_t + \beta_0 first_{it} + \beta_1 rules_{it} + \beta_2 X_{it} + \epsilon_{it}. \tag{2}$$

In each subsample, the dependent variable, $close_{it}$, is an indicator variable equal to one if individual i closes (all of) his IRA account(s) in year t. The primary variables of interest are $first_{it}$, an indicator for the first year of being subject to RMD rules (age $70\frac{1}{2}$), and $rules_{it}$, an indicator for being subject to RMD rules in year t. We include year fixed effects, α_t, as well as a vector of time-varying individual characteristics, X_{it}. These characteristics include a quadratic in age (measured relative to age 60), marital status, an indicator for whether an individual is more than 10 years older than his spouse, and the natural log of the IRA balance.

The year fixed effects control for any determinants of account closures that are common to all individuals in a given year, including market fluctuations. The quadratic in age controls for the propensity of older individuals to close accounts. The parameter ϵ_{it} is an unobserved error component. While this term may be correlated across observations – for example, because an individual appears in the data multiple times – we assume this does not bias the coefficient estimates. The sample used in this analysis is the IRA Holders sample, limited to individuals age 61 through 90 with an account in the previous year, for years 2000 through 2013. The age trends are separately identified from the association of account closure with RMD rules because we include some pre-RMD ages and because we include the 2009 RMD suspension.

Figure 13 demonstrates the unintended consequence of RMD rules, where individuals close IRAs in response to the onset of the rules at age 70.5. This figure displays the mean predicted propensity to close an account by the age of the account holder using the coefficients estimated using Equation 2. We also plot the actual mean occurrence of account closure by age for comparison. The predicted series closely tracks the observed series, including the spike at 70.5. However, the figure masks important heterogeneity in the propensity to close an account. As mentioned, we run the logistic regression for twenty separate ventiles of IRA account balance. Figure 14 shows the marginal effects of the $first_{it}$ and $rules_{it}$ variables from these regressions.

The figure shows that the association between RMD rules and account closure is concentrated among individuals with small account balances. Among individuals in the bottom five percent of account balances (below $3,500 in 2014 dollars), being subject to RMD rules is associated with a six percentage point increase in the likelihood of account closure. Moreover, when first subject to the RMD rules, there is an additional six percentage point increase in the likelihood of account closure. For comparison, individuals in the top half of account balances have their propensity to close their accounts increase by less than one percentage point when subject to RMD rules, even in their first year.

Overall, the patter displayed in Figure 14 is consistent with account closure being highly concentrated at the bottom of the account size distribution during all years of being subject to RMD rules, and significantly less concentrated during the first year one is subject to RMD rules. These results are consistent with adjustment costs of adhering to RMD rules that are independent of account size, overwhelming the minor tax benefits of small accounts. These costs may take the form of a one-time cognitive burden of re-optimization or the annual hassle costs of remembering to comply with RMD rules. The fact that account closure is fairly prevalent in roughly the second through eighth ventiles of account balance ($3,500 to $30,900 in 2014 dollars) only in the first year of being subject to RMDs is consistent with individual heterogeneity in these adjustment costs. When first faced with RMD rules some individuals with modest-but-nontrivial IRAs decide to close them, however, beyond the first year presumably only individuals with relatively small adjustment costs retain their IRAs, and thus after the first year the association with RMD rules and account closure only occurs at the very smallest account sizes.

While we have interpreted account closure as an extensive margin response, it may be that individuals convert their Traditional IRAs to Roth IRAs to avoid the RMD rules. However, we find no evidence that account-closing distributions are more likely to be Roth conversions for $70\frac{1}{2}$-year-olds. Thus account-closing distributions appear to reflect true extensive margin responses rather than shifting across different types of tax-deferred retirement savings accounts.[28]

High transaction costs are also consistent with elevated account closures at age $70\frac{1}{2}$. If the transaction costs associated with repeated IRA withdrawals are large, an individual may defer making any withdrawals until the rules go into effect and then minimize their transaction costs by making a single complete withdrawal at age $70\frac{1}{2}$. However, we find that individuals who close their accounts at age $70\frac{1}{2}$ are equally likely to have made withdrawals from age 65 to 69 as those who do not close their accounts, which suggests that closures are more likely due to frictions.

IV Conclusion

We have shown that Required Minimum Distribution (RMD) rules have a substantial impact on the drawdown of traditional IRA balances. Across a variety of regression analyses, we estimate elasticities of IRA distributions with respect to the RMD between 0.28 and 0.59. These imply that increasing RMDs by ten percent would lead to roughly a three to six percent increase in IRA withdrawals among individuals subject to the rules. In density analysis, we estimate that between 32 to 52% of individuals would prefer to make an IRA withdrawal less than their required minimum, with older IRA holders more likely to be constrained. However, we also estimate that up to 38% of RMD-constrained individuals failed to re-optimize during the RMD holiday of 2009, consistent with substantial optimization frictions, such as inattention, associated with responding to changes in RMD policy.

In addition, we document an extensive margin effect among individuals newly subject to the rules in non-2009 years. Account closures in response to RMD rules exhibit substantial heterogeneity by account balance size, with smaller accounts much more likely to close at the onset of RMDs. This is consistent with adjustment costs associated with complying with RMD rules that are roughly constant across account size, given that the tax benefits of IRAs increase with account size.

[28]Our analysis in support of this is available on request.

Our findings suggest, but are unable to confirm, that traditional IRAs are not used to finance a smooth pattern of consumption during retirement for most IRA holders. Instead, individuals may save in IRAs to finance lumpy consumption, as a form of precautionary saving against future health shocks, or for bequests. While we do not test these hypotheses directly because we do not observe consumption in our data, we believe it is a valuable direction for future research.

There are several implications of potential policy changes to RMD rules. First, by requiring distributions that might have otherwise been delayed, RMDs hasten the collection of tax revenue on both IRA contributions and investment earnings. As a consequence, RMDs reduce the tax expenditure associated with the tax deferral on traditional IRA contributions and earnings that accrue to all contributions. Conversely, RMDs reduce the overall tax benefits of saving in IRAs, potentially reducing retirement savings incentives. Second, the RMD rules put tax preferences for individual retirement saving on par with employer-provided defined benefit pensions, which are subject to their own set of required distribution rules. Therefore, modifying RMDs, for example by increasing the age at which they first apply, would modify the current horizontal equity with the pension system. Finally, altering the rules would have substantive distributional implications, as the effects would be concentrated among constrained individuals – who generally have higher incomes and may not rely on their IRA assets to finance retirement consumption.

We focus our analysis on the decumulation of traditional IRAs because these assets represent a large fraction of overall wealth, are subject to RMD rules, and have account balance and distribution information reported to the IRS. Other types of retirement accounts, such as defined contribution plans and Roth IRAs, do not share all of these features, nor do ordinary savings accounts or non-retirement investment accounts. However, many retirees face a simultaneous decumulation problem with several options for financing consumption. The relative size of IRAs within an individual's portfolio may be an important predictor of their behavior. A full theoretical and empirical treatment of this problem is beyond the scope of this paper, and we caution readers that the behavior of IRA holders may differ substantially from others with non-IRA personal retirement savings, as the median income of households that hold IRAs is more than double the median income of those who do not (Holden and Schrass, 2016).

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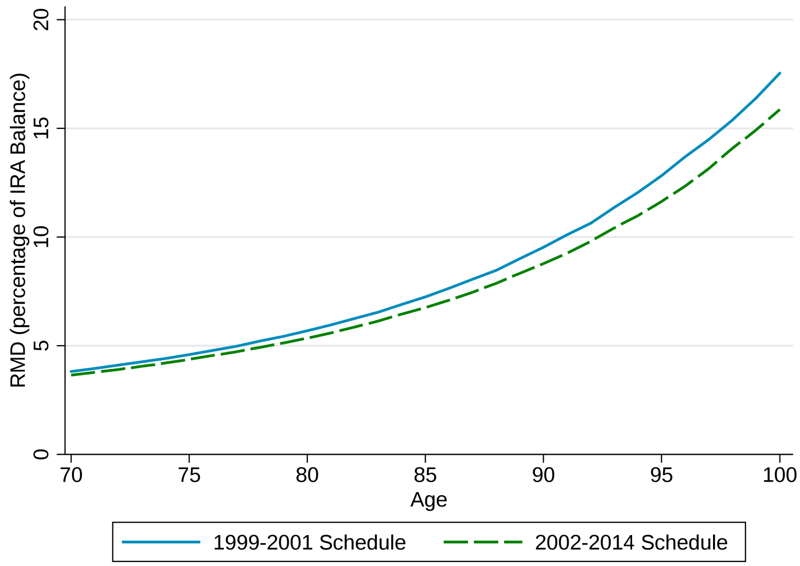
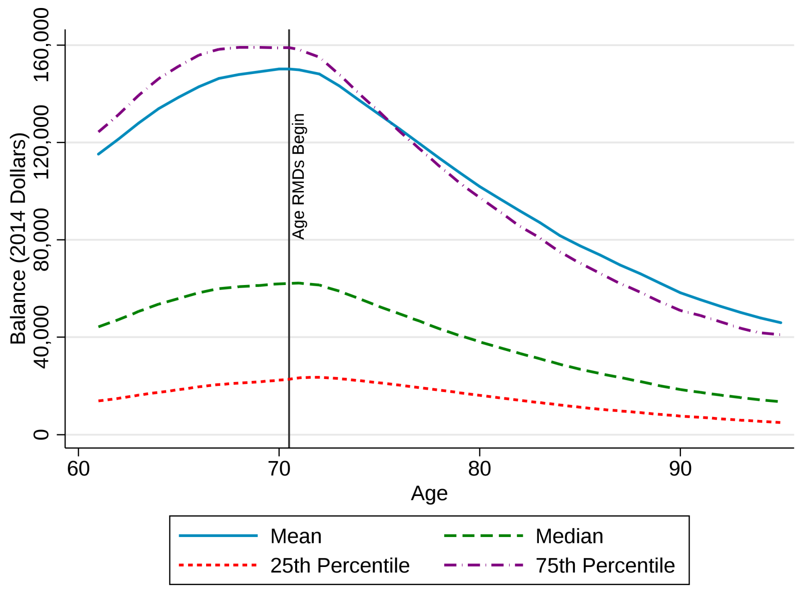
Figures & Tables

Figure 1: Uniform RMD Schedule



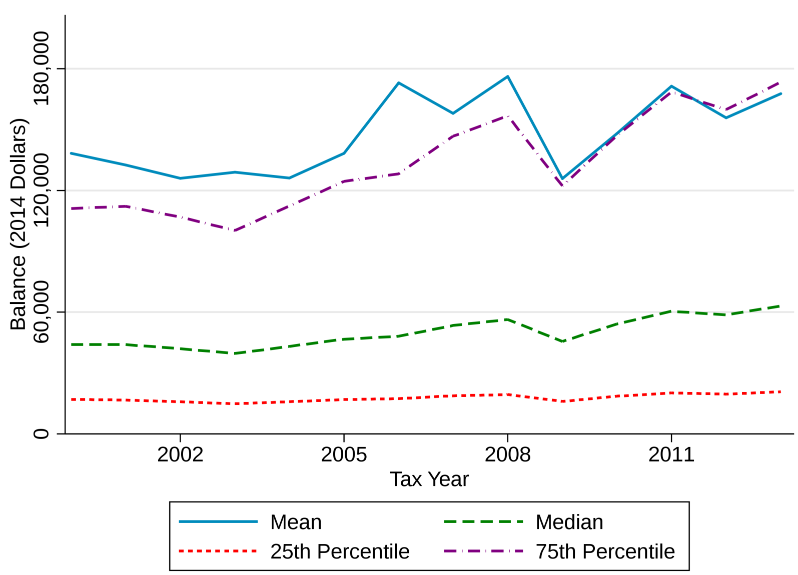
The figure shows the RMD, measured as the percentage of the IRA balance that must be withdrawn, for ages 70 to 100 for the years 1999 to 2014. The schedule changed in 2002, and the schedules before and after the change are displayed. Note that the schedule did not apply in 2009, as the RMD rules were temporarily suspended. The figure was created by the authors.

Figure 2: IRA Balances by Age



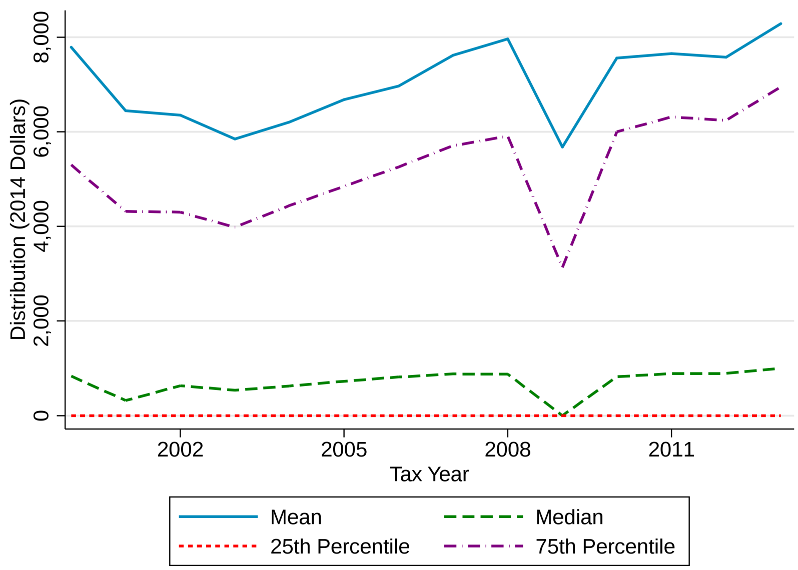
The figure displays statistics on IRA balances among individuals age 60 or older who have a nonzero account balance. The vertical line denotes age $70\frac{1}{2}$, which is the first year RMD rules apply. The data are derived from a five percent random sample of individuals from 2000 to 2013. Dollars are adjusted to 2014 levels. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 3: Balances of IRAs Held by Individuals Age 60 or Older



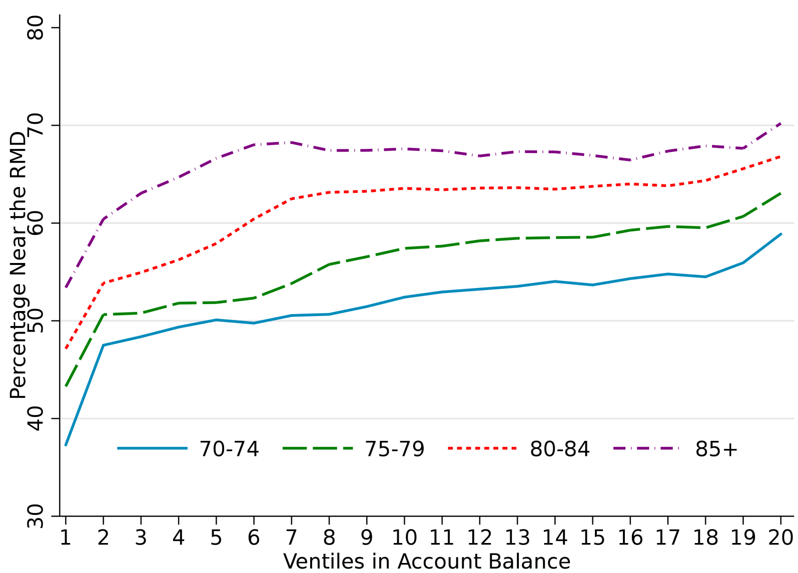
The figure displays mean and quartile values of IRA balances, excluding Roth IRAs, among individuals age 60 or older who have a nonzero account balance. The data are derived from a five percent random sample of individuals from 2000 to 2013. Account balances are measured at the beginning of the calendar year. Dollars are adjusted to 2014 levels. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 4: Distributions from IRAs



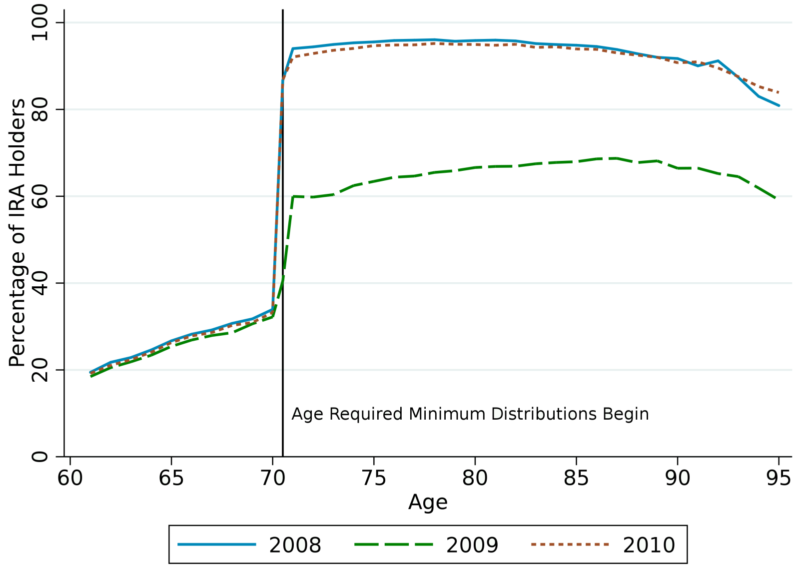
The figure displays statistics on distributions from IRAs, excluding Roth IRAs, among individuals age 60 or older who have a nonzero account balance. The data are derived from a five percent random sample of individuals from 2000 to 2013. Dollars are adjusted to 2014 levels. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 5: RMD Takers by Account Balance and Age (excludes 2009)



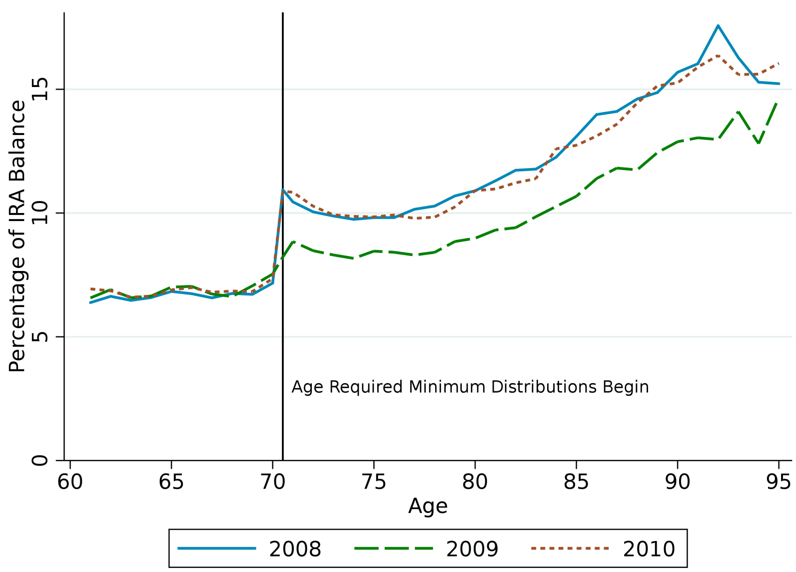
The figure shows the percentage of individuals, among IRA holders subject to RMD rules, who take a withdrawal from their IRAs within half a percentage point of their RMD, by account balance ventile. The four lines correspond to averages for four age groups. The data are derived from a five percent random sample of individuals with Traditional IRAs from 2000 to 2013, excluding 2009. Account balance ventiles are derived from the entire RMD Sample and are not age specific. The cutoff points between the ventiles are, in thousands of 2014 dollars: 3.5, 6.5, 9.7, 13.1, 16.9, 21.1, 25.7, 30.9, 36.9, 44.1, 52.7, 63.3, 76.6, 93.9, 117.2, 150.8, 203.5, 297.4, and 524.7. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 6: Percentage of IRA Holders with Any Distribution (2008-2010)



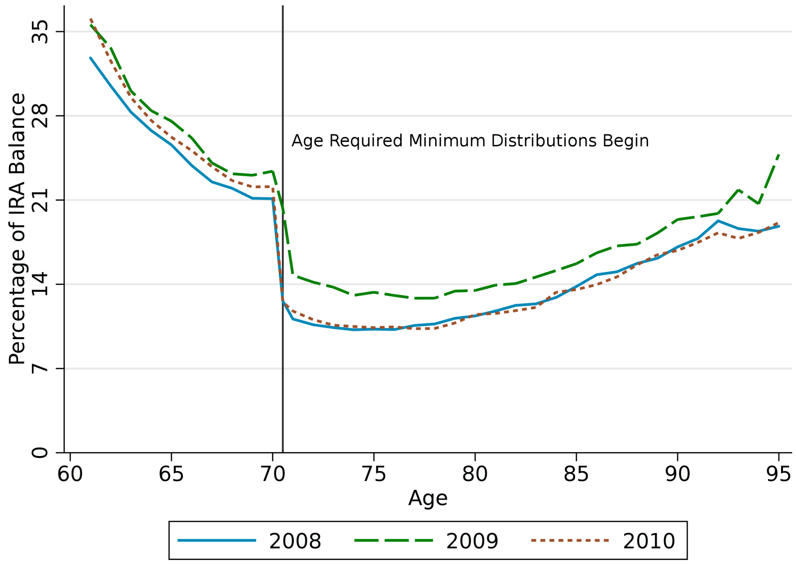
The figure shows the percentage of individuals, among those with a positive IRA balance at the end of the previous year, who take a distribution from their IRAs. The vertical line denotes age $70\frac{1}{2}$, which is the first year RMD rules apply. The data are derived from a five percent random sample of individuals with Traditional IRAs. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 7: Average Distributions from IRAs (2008-2010)



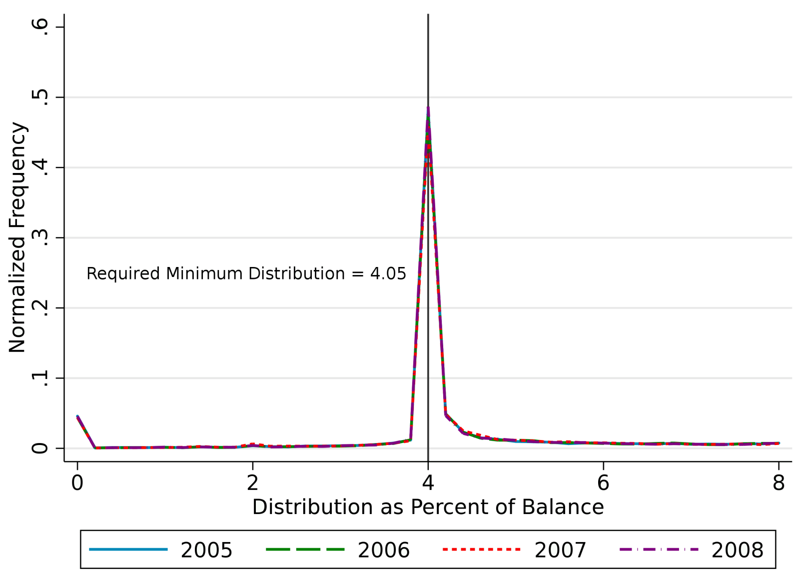
The figure shows the average size of distributions, measured as a percentage of the account balance at the beginning of the year, by age from 2008 to 2010. The vertical line denotes age $70\frac{1}{2}$, which is the first year RMD rules apply. The data are a five percent random sample of individuals with Traditional IRAs, and are limited to those with a positive IRA balance at the beginning of the year. Note that individuals who took zero distributions are included in the calculations. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 8: Average Distributions, Conditional on a Distribution (2008-2010)



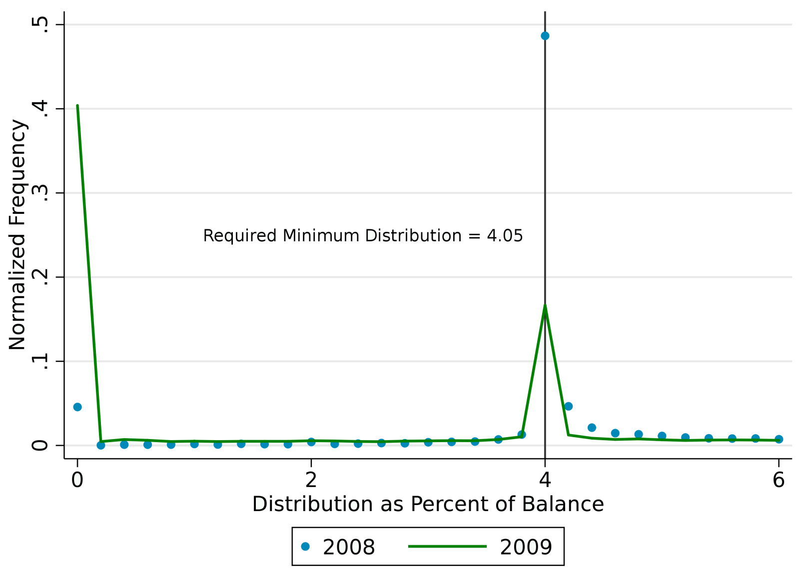
The figure shows the average size of non-zero distributions from IRAs, measured as a percentage of the account balance at the beginning of the year, by age from 2008 to 2010. The vertical line denotes age $70\frac{1}{2}$, the first year RMD rules apply. The data are derived from a five percent random sample of individuals with Traditional IRAs. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 9: IRA Distributions Below 8 Percent for 73-Year-Olds (2005-2008)



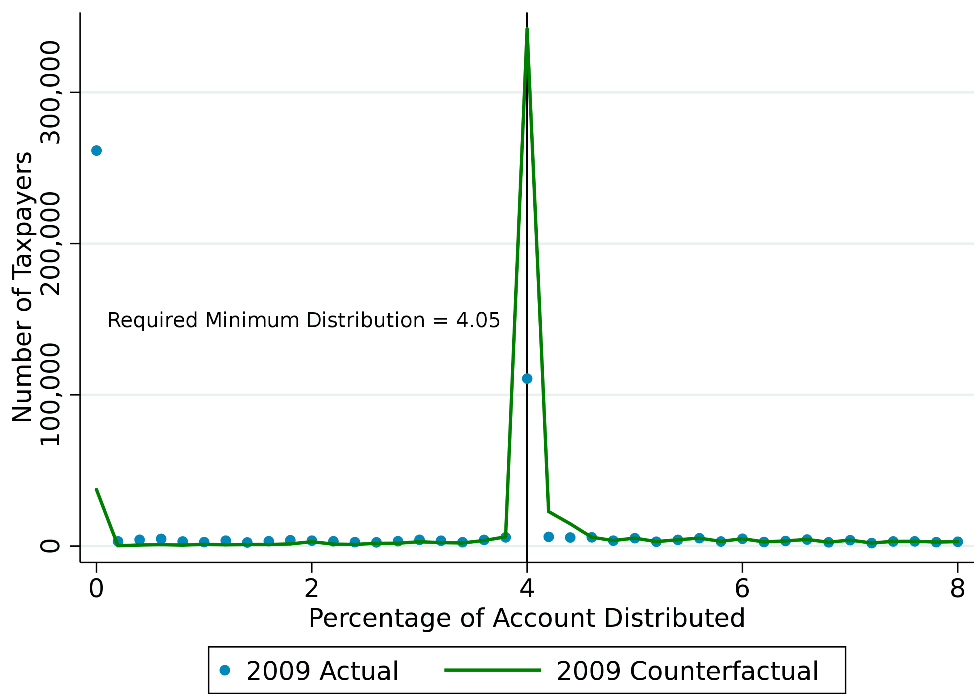
The figure shows the normalized frequency of distributions taken by 73-year-olds from their IRAs, excluding Roth IRAs. The vertical line represents the RMD associated with the Uniform Lifetime Table. The data are derived from a five percent random sample of individuals subject to RMD rules. The figure is truncated to show distributions less than or equal to 8% of IRA balances. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 10: IRA Distributions for 73-Year-Olds (2008-2009)



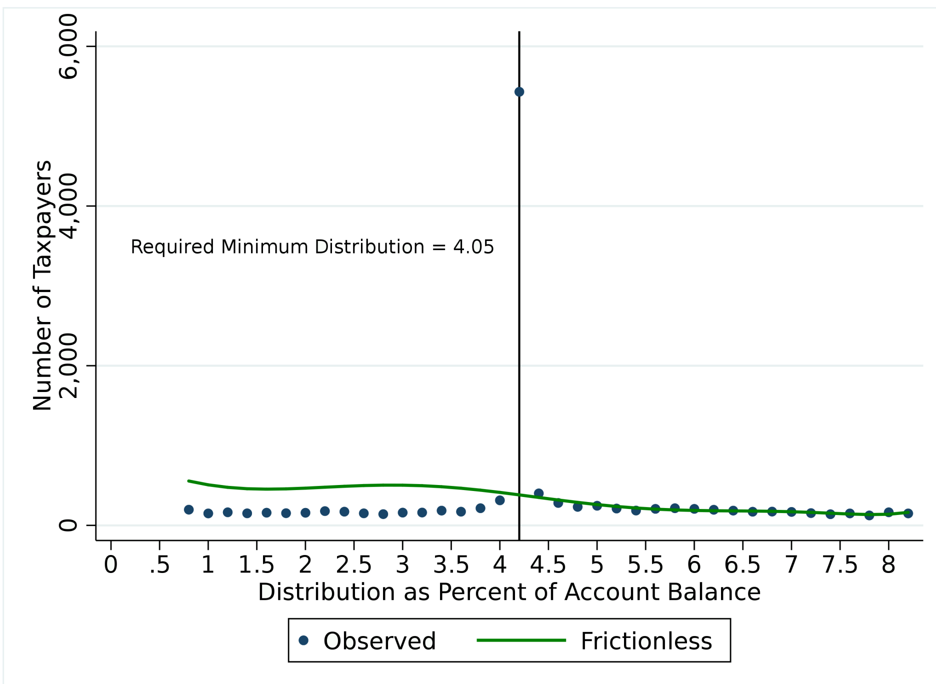
The figure shows the normalized frequency of distributions taken by 73-year-olds from their Traditional IRAs. The vertical line represents the RMD associated with the Uniform Lifetime Table. The data are derived from a five percent random sample of individuals subject to RMD rules. Note that in 2009 the RMD rules were temporarily suspended. The figure is truncated to show distributions less than or equal to 6% of IRA balances. Bin widths are one fifth of a percentage point. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 11: 2009 Counterfactual Densities for 73-Year-Olds



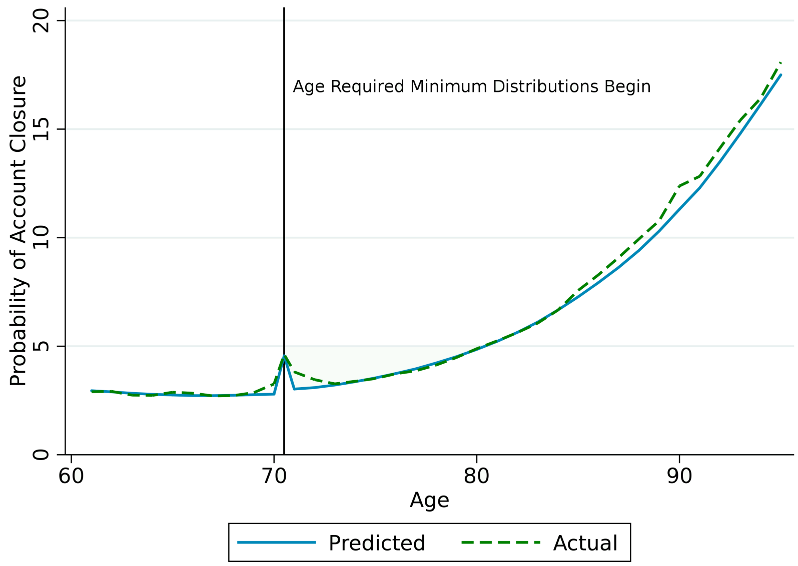
The figure shows 2009 actual and counterfactual histograms of IRA distributions for 73-year-olds. The counterfactual histograms are estimated using the DFL method with a baseline year of 2008. The horizontal axis is limited to distributions that are 8% of account balances or less. Bin widths are one fifth of a percentage point. The figure was created by the authors using a sample drawn from the population of tax and information returns and has been weighted to represent the full U.S. population.

Figure 12: 2009 Frictionless Counterfactual for 73-Year-Olds



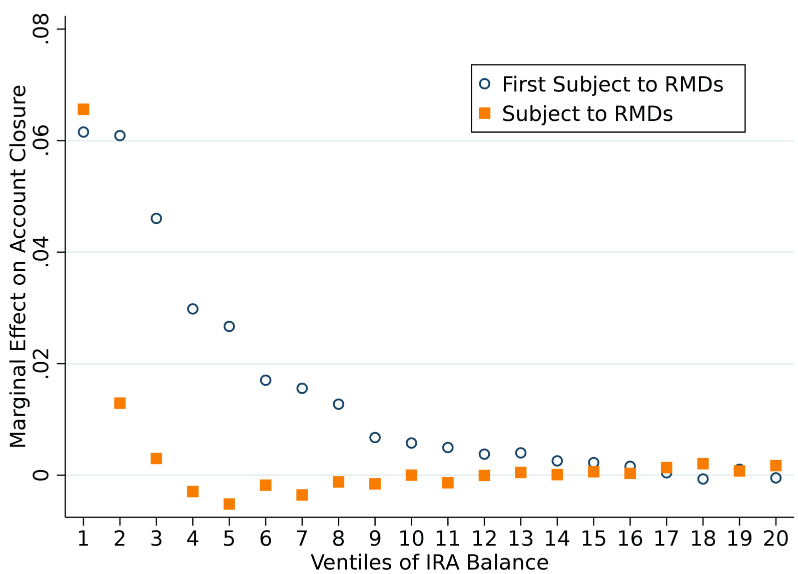
The figure shows the observed histogram of distributions in 2009 for 73-year-olds and the counterfactual histogram of distributions assuming away optimization frictions. Distributions are measured as the percentage of the account balance and are censored at 0.5% and 8%. Bin widths are one fifth of a percentage point. The figure was created by the authors using a sample drawn from the population of tax and information returns. See Online Appendix C for a similar figure that includes the mass at zero.

Figure 13: Percentage with Account-Closing Distributions (2000-2013)



The figure displays the percentage of individuals with account-closing distributions from IRAs by age, and the predicted percentage from a logistic regression of equation 2. See section III.E for more details on the regression specification. The vertical line denotes age $70\frac{1}{2}$, the first year RMD rules apply. The data are derived from a five percent random sample of individuals from 2000 to 2013. Account closures exclude consolidation of multiple IRA accounts and instead indicate a zero balance across all IRAs in the subsequent year. The figure was created by the authors using a sample drawn from the population of tax and information returns.

Figure 14: Account-Closing Distributions (2000-2013)



The figure displays the marginal effects, evaluated at the means, of first being subject to RMD rules. These parameters were estimated using a separate logistic regression for each ventile of IRA account balance of equation 2. See section III.E for more details on the regression specification. Account closures exclude consolidation of multiple IRA accounts and instead indicate a zero balance across all IRAs in the subsequent year. The cutoff points between the ventiles are, in thousands of 2014 dollars: 3.5, 6.5, 9.7, 13.1, 16.9, 21.1, 25.7, 30.9, 36.9, 44.1, 52.7, 63.3, 76.6, 93.9, 117.2, 150.8, 203.5, 297.4, and 524.7. The figure was created by the authors using a five percent random sample drawn from the population of tax and information returns from 2000 to 2013.

Table 1: Summary Statistics, 2013

	5% Sample		**IRA Holders Sample**		**RMD Sample**	
Variable	Mean	Observations (Millions)	Mean	Observations (Millions)	Mean	Observations (Thousands)
Age	71.2	3.2	71.3	1.5	78.0	537
#Years in Sample	10.4	3.2	10.9	1.5	15.3	537
Deceased	8.4%	3.2	6.5%	1.5	9.8%	537
Married (Conditional on Filing)	67.4%	2.3	69.7%	1.3	63.6%	478
Married (Imputed)	60.9%	2.9	66.9%	1.4	61.6%	526
IRA Balance Indicator	37.1%	3.2	80.7%	1.5	95.2%	537
IRA Balance Size	184,850	1.2	184,850	1.2	178,198	511
#Years with Positive IRA Balance	3.8	3.2	8.2	1.5	13.4	537
Distribution Indicator	21.2%	3.2	45.9%	1.5	93.7%	537
Distribution as % of Balance	14.1%	0.6	14.1%	0.6	11.3%	500
Distribution	14,560	0.7	14,560	0.7	12,263	503
Account Closure Indicator	3.7%	1.1	3.7%	1.1	4.8%	537
Account-closing Distribution	56,158	0.0	56,158	0.0	65,203	26
Inheritance Distribution Indicator	6.1%	3.2	7.8%	1.5	10.1%	537
Roth Conversion Indicator	0.5%	1.2	0.5%	1.2	0.3%	511
RMD Indicator	16.9%	3.2	36.8%	1.5	100.0%	537
RMD as % of Balance					5.2%	537
RMD					7,733	537
Distribution Satisfied the RMD					90.0%	537
RMD Excise Tax Penalty Indicator					0.0%	537
Satisfied 1st RMD in 1st Year					84.4%	53
Satisfied 1st RMD in 1st or 2nd Year					90.9%	53

Summary statistics are presented for the 5%, IRA Holders, and RMD Samples. The 5% Sample is representative of the population of individuals age 60 or older in 2013, subject to the caveats in the text. The IRA Holders Sample is the subsample of individuals in the 5% Sample who have a positive IRA balance in at least one year during the sample period. The RMD Sample is the subset of individuals who have a positive RMD for the observation year, subject to the caveats in the text. Dollar figures are presented in inflation-adjusted 2014 dollars. All calculations were performed by the authors using a sample drawn from the population of tax and information returns.

Table 2: Fixed Effects Results–Effect of RMD on Distributions

	(1)	(2)	(3)	(4)	(5)	(6)
Log(RMD Level)	0.561	0.490	0.589	0.283	0.502	0.582
	(0.004)	(0.029)	(0.004)	(0.035)	(0.002)	(0.004)
Log(Account Balance)	0.460	0.449	0.392	0.594	0.236	0.184
	(0.005)	(0.027)	(0.005)	(0.033)	(0.001)	(0.002)
Spouse 10+ years younger	0.123	0.139	0.129	0.084	0.116	0.136
	(0.032)	(0.032)	(0.036)	(0.035)	(0.011)	(0.011)
Married	0.037	0.017	0.019	-0.014	-0.041	-0.037
	(0.006)	(0.006)	(0.007)	(0.006)	(0.002)	(0.002)
First year of RMD	-0.486	-0.401			-0.091	-0.077
	(0.011)	(0.011)			(0.003)	(0.003)
Second year of RMD	0.018	0.017			0.017	0.016
	(0.006)	(0.006)			(0.002)	(0.002)
2009 included?	✓		✓		✓	
Ages 70-72 included?	✓	✓			✓	✓
Log(● + X)	X=1	X=1	X=1	X=1	X=1,000	X=1,000
Observations (millions)	5.61	5.16	4.37	4.02	5.61	5.16
R^2	0.204	0.084	0.200	0.074	0.250	0.179

All columns report results from individual fixed effects regressions where the dependent variable is the natural logarithm of IRA distributions. Regressors include natural logarithms of the RMD and the IRA account balance (measured at the end of the prior year) and indicators for age, year, marital status, whether it is an individual's first and second year subject to RMD rules, and whether one's spouse is 10 or more years younger. The sample in column 1 includes all years from 2000 to 2013, and all ages from 70 to 90. The regression results presented in column 2 are from an analogous specification to column 1, but the year 2009 is excluded. Columns 3 and 4 are analogous to the specifications in columns 1 and 2, but the age restriction is 73 to 90, to avoid the onset of RMDs. All natural logarithms are taken with respect to the variable indicated plus X, where X equals 1 in the first four columns and 1,000 in the last two. Otherwise, columns 5 and 6 are analogous to columns 1 and 2. In all columns, standard errors are clustered at the individual level. All calculations were performed by the authors using a sample drawn from the population of tax and information returns.

Table 3: Difference between Actual and Counterfactual Densities by Age

Age	2009 Density at RMD	2009 Counterfactual Density at RMD	Difference in Density at RMD	Difference in Density at Zero
73	0.20	0.54	-0.34	+0.35
74	0.23	0.57	-0.34	+0.33
75	0.23	0.57	-0.34	+0.32
76	0.25	0.59	-0.34	+0.32
77	0.26	0.59	-0.33	+0.31
78	0.27	0.59	-0.32	+0.31
79	0.27	0.62	-0.35	+0.30
80	0.28	0.58	-0.30	+0.30
81	0.29	0.60	-0.31	+0.29
82	0.30	0.61	-0.31	+0.29
83	0.30	0.61	-0.31	+0.28
84	0.32	0.61	-0.29	+0.28
85	0.33	0.61	-0.28	+0.27

The table reports the differences between the 2009 actual and counterfactual histograms, as estimated using the DFL method, at two points: zero and the level of the 2008 RMD. The differences are calculated within half a percentage point of each of these points. To estimate the counterfactual histogram, 2008 is used as the baseline year. Results are shown by age from 73 to 85. All calculations were performed by the authors using a sample drawn from the population of tax and information returns.

Table 4: Optimization Frictions in 2009 by Age

Age	Sample Size	Near Phantom RMD	Affected by Frictions
73	32,900	20.2%	14.3%
74	31,200	22.4%	15.5%
75	29,500	23.3%	16.8%
76	26,800	25.3%	18.3%
77	26,500	26.1%	19.0%
78	25,400	26.9%	19.2%
79	24,700	27.2%	20.3%
80	22,600	28.2%	22.2%
81	21,200	28.7%	21.6%
82	19,700	29.6%	23.5%
83	17,500	29.9%	23.0%
84	15,900	31.7%	24.9%
85	14,100	32.6%	25.8%
73-85	308,000	26.3%	19.5%

The table presents evidence on those affected by optimization frictions during the 2009 RMD rule suspension, using the RMD Sample. Being near the phantom RMD is defined as taking a distribution within 0.5 percentage points of the phantom RMD – that is, the RMD that would have applied had the rules been active. The percentage affected by frictions is estimated using counterfactual histograms as described in Section III.D. Sample sizes are rounded to the nearest hundred. All calculations were performed by the authors using a sample drawn from the population of tax and information returns.