How Do Distributions from Retirement Accounts Respond to Early Withdrawal Penalties? Evidence from Administrative Tax Returns*

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Abstract

The design of retirement savings accounts must balance the long-term goal of retirement wealth accrual with the potential need for liquidity in the short-term. Penalties (and exceptions) for pre-retirement withdrawals provide a possible lever for striking this balance. In the United States, penalties are typically limited to 10 percent of withdrawn funds and several exceptions are available, including partial or full exemptions for the unemployed, disabled, or those incurring unreimbursed medical expenses. In this paper, we investigate how individuals respond to the removal of the 10 percent penalty imposed on Individual Retirement Account (IRA) withdrawals prior to the account holder turning $59\frac{1}{2}$. Our analysis employs rich tax records from the Internal Revenue Service (IRS) and develops new empirical techniques which allow us to use annual data to better understand movements at higher levels of frequency. We find some evidence that individuals retime a portion of their IRA withdrawals from the one month prior to turning $59\frac{1}{2}$ to the month after. We also find that the higher level of withdrawals after reaching $59\frac{1}{2}$ persist in the long run, implying a 75 percent increase in annual withdrawals on average among our population. We use benchmarks from a lifecycle model with both a liquid and illiquid account to draw further connections between our empirical results and key theoretical parameters.

Keywords: retirement savings accounts, withdrawals, distributions, penalty

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1 Introduction

In the United States, Americans have an estimated $14.4 trillion invested in employer-sponsored defined contribution plans and individual retirement accounts (Investment Company Institute, 2015). These funds typically receive preferential tax treatment, which allows households to accumulate retirement savings at a faster rate than in normal savings vehicles. In exchange for this preferential tax treatment, the accounts are relatively illiquid, as a penalty is typically imposed for withdrawals occurring before the account holder turns $59\frac{1}{2}$. This penalty is designed to dissuade people from accessing these funds prior to retirement, but there are several avenues to partially or completely liquidate funds in tax-preferred retirement savings accounts prior to retirement.[1]

The degree of illiquidity in retirement savings accounts, as determined by the rate of the penalty, the age threshold where the penalty is lifted, and the exceptions to the penalty that are granted, has implications for the accumulation of assets for retirement. First, it may affect the amount that is withdrawn from accounts prior to retirement, known as "leakage." Recent evidence suggest that leakage is substantial, amounting to approximately $0.40 of every $1 contributed into the account prior to the age of 55 (Bryant, Holden and Sabelhaus, 2010; Argento, Bryant and Sabelhaus, 2015). Leakage reduces wealth available for retirement substantially, and the potential to access retirement funds prior to retirement could lead present-biased individuals to accumulate lower levels of retirement wealth (Beshears et al., 2014, 2015*a*; Goda et al., 2015). This evidence suggests that increasing the illiquidity in retirement accounts could increase the amount of wealth accumulated for retirement by making the account a more effective commitment device.

Second, the degree of illiquidity affects the ability of individuals to smooth consump-

[1]First, many accounts grant exceptions from the penalty for several reasons including death or disability, education expenses, first-time home purchases, and unreimbursed medical expenses. In addition, job transitions can provide opportunities to liquidate tax-preferred retirement savings accounts with funds less than a specified threshold, and some accounts allow loans which may become withdrawals if not paid back upon job separation. For instance, the IRS waives any penalties for workers aged 55 and older after a job termination. Finally, many accounts allow withdrawals to be taken for any reason subject to a penalty being paid.

tion by self-insuring against negative shocks. Wealth accumulated in retirement savings accounts can provide an important form of insurance. Indeed, previous studies find that early withdrawals are strongly correlated with shocks to income or marital status or represent consumption-smoothing behavior by liquidity-constrained households who experience financial shocks (Amromin and Smith, 2003; Argento, Bryant and Sabelhaus, 2015). If retirement savings accounts facilitate insurance against negative income shocks, then some level of liquidity prior to retirement may be optimal. Finally, the degree of liquidity in retirement saving accounts changes the attractiveness of saving in those accounts relative to accounts where pre-retirement withdrawals are forbidden.

The potential consumption-smoothing benefits retirement savings accounts can provide may be at odds with the goals of retirement wealth accumulation. As a result, there has been recent discussion regarding adjusting the age threshold for penalty-free withdrawals (Munnell and Webb, 2015) or changing the amount of the penalty (Beshears et al., 2014). Moreover, several other developed countries, which generally lack options for early withdrawal, are in the process of discussing providing early access to retirement savings (Beshears et al., 2015*a*; Agarwal, Pan and Qian, 2016). Despite these active policy debates, there is not a large amount of literature seeking to understand the implications of these potential policies.

In this paper, we examine the withdrawal behavior of individuals as they cross the age $59\frac{1}{2}$ threshold in retirement savings accounts when the penalty for early withdrawals is removed. We assess the ability of savers to take advantage of penalty exceptions and smooth consumption in response to negative shocks by analyzing the heterogeneity in the response to the penalty across characteristics associated with shocks faced near the age threshold. If the exceptions to the penalty fully insure people from these shocks, we would expect to see higher rates of penalty-free withdrawals prior to $59\frac{1}{2}$ and smaller increases at $59\frac{1}{2}$.

We evaluate our results relative to a benchmark model of consumption where consumers have access to both a liquid savings account and an illiquid savings account with a fully-anticipated change in the degree of illiquidity. Our model relates to current efforts among

macroeconomists to generate models of consumption that produce large marginal propensities to consume from transitory income fluctuations, which have been estimated empirically but do not arise under standard consumption theory (Kaplan and Violante, 2014; Johnson, Parker and Souleles, 2006). The comparison of actual withdrawal patterns relative to our benchmark model allows us to understand whether models of this nature can fit the empirical patterns we see in the data, and thus can also inform macroeconomic models of consumption at older ages. This work also has implications for decisions to claim Social Security, where Social Security wealth resembles an illiquid savings account until one attains the earliest claiming age.

Our analysis uses tax records from the full sample of individuals born between July 1, 1941 and July 1, 1951 from tax years 1999 through 2013 which contain information regarding individuals' retirement accounts, contributions, withdrawals, as well as one's filing status, adjusted gross income, wages, and other items collected by tax forms. While these data have several advantages, the fact that they can only obtained on an annual basis rather than higher levels of frequency presents difficulties in distinguishing between general increases in retirement withdrawals as individuals age from increases occurring as a result of the removal of the penalty at age $59\frac{1}{2}$.

In order to identify the response in retirement account withdrawals, we exploit differences in exposure to penalty-free withdrawal within a calendar year stemming from variation in one's date of birth. For instance, someone whose birthday is July 1, 1949 attains $59\frac{1}{2}$ on January 1, 2009 and thus has a full year of exposure to penalty-free withdrawals in 2009. By contrast, an individual born on June 30, 1950 attains age $59\frac{1}{2}$ at the end of the year on December 30, 2009 and only experiences one day of penalty-free withdrawal in 2009. Building on that intuition, we introduce a novel method for using annual data to parametrically recover an event study at age $59\frac{1}{2}$.

Our findings indicate that retirement savings illiquidity affects financial decisions. We find that increases in annual withdrawals in the calendar year one turns $59\frac{1}{2}$, relative to

the previous calendar year, are larger for individuals who attain age $59\frac{1}{2}$ early in the year relative to those who attain age $59\frac{1}{2}$ late in the year. We find evidence of some retiming of distributions in the short-run: distributions decline in the month leading up to the penalty-free period, and increase sharply in the first month that withdrawals are not subject to a penalty. In addition, our empirical estimates indicate that crossing the age $59\frac{1}{2}$ threshold leads to an approximately \$1,500 (or 75 percent) long-run increase in annual distributions from Individual Retirement Accounts (IRAs), on average. This higher long-run rate of withdrawals after $59\frac{1}{2}$ suggests that the increase does not merely represent a retiming of withdrawals and that increasing liquidity by either lowering the age threshold or reducing the penalty would potentially lead to more leakage. We also examine the heterogeneity in the response to lifting the penalty on withdrawals. Our analysis shows that individuals with above median income experience larger absolute but smaller relative increases in withdrawals at the $59\frac{1}{2}$ threshold than those with below median income.

Our paper builds on related literature that examines how withdrawals from retirement savings accounts change over the lifecycle and in response to various provisions. Perhaps most relevant, recent work by Agarwal, Pan and Qian (2016) examines how withdrawals from pension savings in Singapore responds to a sharp change in the ability to cash out savings at age 55. Using data from a large bank, the authors construct a monthly event study surrounding age 55 and show that account balances and credit card spending increase upon turning 55, while credit card debt decreases. Prior work using U.S. data show increases in withdrawals by age (e.g., Sabelhaus (2000)), but does not allow for higher-frequency event studies to uncover the relationship between withdrawal penalties and withdrawal amounts.

Recent studies examine withdrawals behavior surrounding the age threshold for required minimum distributions. Poterba, Venti and Wise (2013) find that withdrawal behavior increases sharply after age $70\frac{1}{2}$ using data from the SIPP, suggesting that households tend to preserve retirement assets to self-insure against large and uncertain late-life expenses. Brown, Poterba and Richardson (2014) examine how the 2009 one-time suspension of the

rules associated with required minimum distributions affected withdrawals for TIAA-CREF participants and find that one third of those affected by the rules discontinued their withdrawals when the rules were suspended. Using administrative tax data, Mortenson, Schramm and Whitten (2016) similarly find that required minimum distributions cause funds to be drawn down more quickly than otherwise, and, additionally, that some accounts are closed in response to the policy.

We make several contributions to this literature. First, we provide, to our knowledge, the first causal estimates of the effect of removing the 10 percent penalty from pre-retirement withdrawals on withdrawal behavior in the U.S. Under the assumption that other characteristics that affect distribution behavior vary smoothly across the age $59\frac{1}{2}$ threshold, our estimates can be interpreted as the result of the change in penalty rather than other factors. We also evaluate the role of exceptions as a form of targeted liquidity in providing consumption-smoothing benefits after negative shocks.

Second, we use a novel, comprehensive data source that provides high-quality data on withdrawals from information returns provided by the IRS. Given the relatively small numbers of individuals taking withdrawals from retirement savings accounts near the age $59\frac{1}{2}$ threshold, household surveys are unlikely to uncover any changes occurring precisely at age $59\frac{1}{2}$. In addition, household surveys may underreport withdrawals from retirement savings accounts, as even withdrawals recorded on Form 1040 are approximately 20 percent lower than implied by information returns (Argento, Bryant and Sabelhaus, 2015).

Finally, we develop empirical techniques to convert data at a lower frequency into a higher frequency event study by exploiting variation by date of birth. These techniques are similar to, but distinct from, techniques that exploit differences in the distribution of temperature each year to identify the effect of particular daily temperatures on outcomes in the climate change literature (Deschênes and Greenstone, 2011; Deryugina and Hsiang, 2014). Our method can potentially be used in a variety of different settings, including, for example, understanding the effect of sharp changes in eligibility for Social Security on related

outcomes.

The remainder of the paper proceeds as follows. We provide background information about retirement savings plans and their liquidity in the U.S. in Section 2. Section 4 lays out our empirical strategy, and Section 5 describes institutional features and the data we use for the study. We discuss results in Section 6 and conclude in Section 7.

2 Background: Retirement Liquidity in the U.S.

A large component of retirement savings in the U.S. is in tax-preferred savings accounts, including both employer-sponsored defined contribution plans (e.g., 401(k)s) and Individual Retirement Accounts (IRAs). These accounts allow individuals to contribute funds annually, up to a set maximum. Contributions are either made with pre-tax assets and taxed when withdrawn, as in the case of Traditional IRAs or 401(k)s, or made with after-tax assets and exempt from taxes when withdrawn, as in the case of Roth IRAs or Roth 401(k)s.

In order to encourage individuals to use the proceeds from these accounts for retirement, the government imposes various restrictions or penalties against withdrawing funds for other purposes. The restriction depends on precisely which type of account is being withdrawn from. Typically, traditional IRAs allow early withdrawals for any reason, but these early withdrawals are subject to a 10 percent penalty. Exceptions to the penalty are made in the event of death or disability, for first-time homebuyers, education expenses, health insurance premiums while unemployed, and unreimbursed medical expenses. Since Roth IRA contributions are made on an after-tax basis, withdrawing the basis – and not the earnings – can be done without penalty.

Pre-retirement withdrawals from 401(k) plans can be made only in the event of a hardship, or an immediate and heavy financial need. Certain expenses are deemed to be immediate and heavy, including certain medical expenses, the purchase or repair of a principal residence, and burial or funeral expenses. These early withdrawals are subject to a 10 percent penalty,

with some exceptions (e.g., upon the death or disability of the account holder).

All penalties and restrictions are lifted once an individual turns $59\frac{1}{2}$. The IRS calculates age $59\frac{1}{2}$ by determining the month and year in which an individual turns 59, moving six months forward, and then choosing the day in that month that corresponds to the day of birth. While in most cases this is straightforward, there are some cases where special rules apply. For instance, if someone is born on August 31, 1970 the above rules would specify February 31, 2030 as the day they turn $59\frac{1}{2}$. Since this day does not exist, the rules indicate that one should calculate the residual days left over at the end of the month (three in this case, since February ends on February 28) and advance that many days forward (March 3, 2030 in this example). Individuals born on leap days turn $59\frac{1}{2}$ on September 1 in the year in which they turn 59. In other words, the IRS considers them age $59\frac{1}{2}$ on the same day as someone born on March 1 in the same year.

While not the focus of this paper, there is also a sharp change in rules regarding withdrawals when an individual turns $70\frac{1}{2}$ and is subject to required minimum distributions (RMDs). RMDs apply to all employer-sponsored retirement plans and traditional IRAs and specify minimum amounts that an account owner must withdraw annually starting the year he or she attains age $70\frac{1}{2}$.[2] These rules are designed to limit the amount of tax deferral provided to retirement savings accounts.[3]

It is worth noting that the liquidity in retirement savings accounts in the U.S. is generally higher than other developed countries. Beshears et al. (2015*b*) compare the liquidity in retirement savings systems across six developed countries and show that the U.S. has a much more liquid system with relatively low penalties for early withdrawals, and several exceptions for penalty-free withdrawals.

[2]For employer-sponsored retirement plans, individuals are exempt from RMDs if they are not retired.
[3]Note that Roth IRAs do not require minimum distributions until after the death of the account holder.

3 A Model of IRA Withdrawals

In this section, we present model designed to capture some key features of the decision-making environment in our setting. We begin with a simple model of IRA withdrawals and introduce a number of extensions that result in a set of stylized patterns. These basic patterns will eventually be compared to what we can estimate in the data, potentially shedding light on the key parameters of the model. We conclude with a discussion of how a more general model with richer structure might alter the predictions.

3.1 A Simple Model with 4 Periods – TBD

We start with a stripped down version of the model. We use 4 periods in order to accommodate two features. First, we need at least two pre-$59\frac{1}{2}$ periods, in order to examine whether withdrawals decline as one gets closer to this date. Second, we have one post-$59\frac{1}{2}$ period. We finally add an initial period, Period 0, where an initial allocation of assets are made between the liquid and illiquid accounts, to account for the endogenous portfolio one faces as one begins to potentially drawn down illiquid funds prior to $59\frac{1}{2}$.

The model is similar in spirit to that of (Kaplan and Violante, 2014), in which a fixed cost of adjusting illiquid assets can generate what is referred to as "wealthy hand-to-mouth behavior." In our setting, the wedge created by penalties on illiquid account withdrawals plays a similar role.

Household Problem: The household lives for four periods, $t = 0, 1, 2, 3$, but consumes only in the last 3 periods. Preferences over consumption are given by:

$$v_0 = \sum_{t=1}^{3} \beta^{t-1} u\left(c_t\right)$$

where $u' > 0$ and $u'' < 0$. We will use the following CRRA function form for utility:

$$u\left(c\right) = \frac{c^{1-\gamma}}{1-\gamma}$$

Each period, the household receives a certain flow of income, y_t. In addition, the household has two assets that it can use to save, one illiquid and the other liquid. The features of these accounts vary over time.

Period 0: In period 0, the household has an inital endowment of ω. It can be split between a liquid asset and an illiquid asset. The amount deposited into the liquid asset is a_0 and the amount deposited into the illiquid asset is d_0. The liquid asset has a return of R_a and the liquid asset has a return R, with $R > R_a \geq 1$. We will assume no borrowing, i.e. $a_t \geq 0$. We will denote the balance of the liquid account as $n_t \geq 0$. Note, we therefore have:

$$\begin{aligned} a_t &= R_a a_{t-1} \\ n_t &= R n_{t-1} \end{aligned}$$

In addition, in each period, the agent has a maximum illiquid deposit that can be made, at $\bar{d}$.

Periods 1 and 2: Periods 1 and 2 are pre-periods. During these periods, the agents can draw down account balances or add to them. Given an illiquid balance n_t the deposit or withdrawal from the account is bounded by $d_t \geq -n_t$. During the pre-period, the illiquid account features a penalty of τd_t on withdrawals from the illiquid account, i.e. an early withdrawal penalty.

Period 3: In Period 3, the early withdrawal penalty is removed, and all of features of the accounts are the same. Also, since it's the last period, all assets are consumed.

Additional Notation: We will denote $m_t = y_t + R_a a_{t-1}$ as cash on hand in period t. We will also denote $v_t(m, n)$ as the value function for a given period, i.e. the optimal utility that is realized, given cash on hand m and illiquid account balance n.

Period 3 Solution: The solution in period 3 is trivial. We will have: $c_3 = y_3 + R_a a_2 + R n_3 = m_3 + n_3$, $d_3 = -n_3$, and $a_3 = 0$.

$$\begin{aligned} c_3 &= y_3 + R_a a_2 + R n_3 \\ &= m_3 + n_3 \\ d_3 &= -n_3 \\ a_3 &= 0 \\ v_3(m_3, n_3) &= u(m_3 + n_3) \\ \frac{\partial v_3}{\partial m} &= \frac{\partial v_3}{\partial n} = u'(m_3 + n_3) \end{aligned}$$

Period 2 Solution: The agent solves the following maximization problem:

$$\max_{a_2, d_2} u(m_2 - a_2 - d_2) + \beta u(y_3 + R_a a_2 + R(n_2 + d_2))$$

First, we solve for the optimal withdrawal. The first order condition for the withdrawal is:

$$\begin{aligned} (1-\tau) u'(m_2 - (1-\tau) d_2) &= R\beta u'(y_3 + R(n_2 + d_2)) \\ \rightarrow (1-\tau)(m_2 - d_2)^{-\gamma} &= R\beta (y_3 + R(n_2 + d_2))^{-\gamma} \end{aligned} \tag{1}$$

Note here that liquid savings, a_2, are set to zero, since any saving in the iliquid account is suboptimal when one is simultaneously withdrawing from the illiquid account. Formally, $a_2 = 0$ whenever:

$$u'(m_2 - (1-\tau) d_2) < R_a \beta u'(y_3 + R(n_2 + d_2))$$

which is the case whenever (1) holds. Rearranging (1), we have:

$$d_{2,with} = \frac{\left(\frac{R\beta}{1-\tau}\right)^{\frac{1}{\gamma}} m_2 - y_3 - Rn_2}{(1-\tau)\left(\frac{R\beta}{1-\tau}\right)^{\frac{1}{\gamma}} + R} \tag{2}$$

For notational convenice, we will define $\theta_\tau \equiv \left(R\beta/\left(1-\tau\right)\right)^{\frac{1}{\gamma}}$, and rewrite this as:

$$d_{2,with} = \frac{\theta_\tau m_2 - y_3 - Rn_2}{\theta_\tau + R} \tag{3}$$

We now solve for the optimal deposit into the illiquid account, which satisfies:

$$\begin{aligned} u'\left(m_2 - d_2\right) &= R\beta u'\left(y_3 + R\left(n_2 + d_2\right)\right) \\ \rightarrow \left(m_2 - d_2\right)^{-\gamma} &= R\beta\left(y_3 + R\left(n_2 + d_2\right)\right)^{-\gamma} \end{aligned} \tag{4}$$

where again liquid savings are zero, because they are dominated by savings in the illiquid account, which earns a higher return and becomes liquid in Period 3. Rearranging terms, we have:

$$d_{2,dep} = \frac{\theta m_2 - y_3 - Rn_2}{\theta + R} \tag{5}$$

where we have defined $\theta \equiv \left(R\beta\right)^{\frac{1}{\gamma}}$. There are four other cases of interest. First, the agent may fully liquidate the illiquid account. This is true whenever $d_{2,with} \leq -n_2$. Second, the agent may locate at a kink, where no deposits and no withdrawals are made from the illiquid account. This is true whenever $d_{2,with} \geq 0$ and $d_{2,dep} \leq 0$. Next, the agent may reach an upper bound on deposits into the illiquid account, which happens whenver $d_{2,dep} \geq \bar{d}$. Finally, once the agent has reached the maximum deposit in the illiquid account, then, and only then, they may also consider depositing into the liquid account. If a deposit is made into the liquid account, it will satisfy the following first order condition:

$$u'\left(m_2 - a_2 - \bar{d}\right) = R_a\beta u'\left(y_3 + R_a a_2 + R\left(n_2 + \bar{d}\right)\right)$$

$$\rightarrow \left(m_2 - a_2 - \bar{d}\right)^{-\gamma} = R_a\beta\left(y_3 + R_a a_2 + R\left(n_2 + \bar{d}\right)\right)^{-\gamma} \quad (6)$$

Rearraning terms, we can solve for the amount of liquid savings:

$$a_{2,\bar{d}} = \frac{\theta_a\left(m_2 - \bar{d}\right) - y_3 - R\left(n_2 + \bar{d}\right)}{\theta_a + R_a}$$

where we have defined $\theta_a \equiv (R_a\beta)^{\frac{1}{\gamma}}$. Note, that liquid savings will be positive, whenever we have $d_{2,dep} \geq \bar{d}$ and $a_{2,\bar{d}} > 0$. Otherwise, we remain at a corner solution, with $a_3 = 0$.

4 Empirical Methods

While we observe the average amount of pre-retirement withdrawals and the share taking withdrawals from IRA accounts at an annual frequency, we would like to understand how these outcomes evolve at a more granular level and, in particular, in a neighborhood near age $59\frac{1}{2}$. Our empirical strategy leverages variation in exposure to pre-retirement withdrawal penalties driven by date of birth to recover patterns at a subannual frequency. For example, take two individuals, one born on June 30, 1950 and another born on July 1, 1950. According to IRS rules, the former turns $59\frac{1}{2}$ on December 30th, 2009, while the latter turns $59\frac{1}{2}$ on January 1st, 2010. Differences in their annual pre-retirement withdrawals and the share taking withdrawals in 2009 can be related to the fact that one person has experienced two days of penalty free withdrawals while the other faced the penalty the entire year. We generalize this notion below. First, we present a method, relying on strong parametric assumptions, that uses annual patterns in year-to-year withdrawal levels and withdrawal rates to test for a discontinuous effect of the age $59\frac{1}{2}$ threshold. Second, we provide a less restrictive approach that allows us to estimate event studies at age $59\frac{1}{2}$ at a daily frequency.

We motivate our empirical approach with a model of average daily pre-retirement withdrawals. We assume that average pre-retirement withdrawals would evolve in a continuous and gradual fashion from day-to-day in the absence of sharp changes in withdrawal penalties.

Suppose the daily pattern of withdrawals can be characterized as follows:

$$y_{bd} = \tilde{\alpha} + \tilde{\lambda}_d + f\left(d - b - a^*\right) + D \cdot \mathbf{1}\left\{d - b \geq a^*\right\} + \varepsilon_{bd}, \tag{7}$$

where y_{bd} is the average daily withdrawal on day d among individuals born on day b, $\tilde{\lambda}_d$ is a calendar day fixed effect, a^* is the number of days it takes to reach age $59\frac{1}{2}$, and ε_{bd} is a mean-zero error term. The function $f(\cdot)$ governs the age pattern of pre-retirement withdrawals, and its argument is measured relative to age $59\frac{1}{2}$. The function $\mathbf{1}\{\cdot\}$ is an indicator function, and, thus, the parameter D represents an additively separable shift in average pre-retirement withdrawals upon reaching age $59\frac{1}{2}$.

4.1 Annual Patterns

As a first step toward testing for a discontinuous change in behavior upon turning age $59\frac{1}{2}$, we show what can be inferred from annual patterns of pre-retirement withdrawals and the share making withdrawals. We make the extreme assumption that, aside from the possible discontinuity at age $59\frac{1}{2}$, pre-retirement withdrawals are locally linear in age, i.e. $f(j) \equiv c \cdot j$. For ease of illustration, we further assume for the moment that $\tilde{\lambda}_d = 0$.[4] Let e measure event time in years. That is, $e = 0$ in the year in which one reaches age $59\frac{1}{2}$, $e = -1$ in the year in which one turns $58\frac{1}{2}$, and so forth. We define the average annual withdrawals during event year e, for individuals born on day b, as $y_{be} \equiv \sum y_{bd}$.

Now, suppose we group individuals into cells based on the quarter in which age $59\frac{1}{2}$ is reached and event year. Within each cell, we will calculate average annual withdrawals, denoted $\overline{y}_{qe} \equiv \sum_{b:q(b)=q}\left(N_b \cdot y_{be}\right) \Big/ \sum_{b:q(b)=q} N_b$, where N_b is the number of individuals born on day b and the mapping $q(b) \in \{1, 2, 3, 4\}$ returns the quarter in which someone born on day b reaches age $59\frac{1}{2}$. Finally, let the change in this average from event year $e-1$ to e be

[4] It is straightforward to relax this assumption by including calendar year fixed effects in the regressions below in equations (9) and (11).

denoted as $\triangle y_{qe} \equiv \overline{y}_{qe} - \overline{y}_{qe-1}$. Using equation (7), we can show the following:[5]

$$\begin{aligned} \triangle y_{q,-1} - \triangle y_{q',-1} &\approx 0 \\ \triangle y_{q,0} - \triangle y_{q',0} &\approx [q' - q] \cdot (365/4) \cdot D \\ \triangle y_{q,1} - \triangle y_{q',1} &\approx -[q' - q] \cdot (365/4) \cdot D. \end{aligned} \tag{8}$$

In words, we first measure the change in pre-retirement withdrawals from the year in which one turns $57\frac{1}{2}$ to the year in which one turns $58\frac{1}{2}$. The difference in this change across different quarters of reaching age $59\frac{1}{2}$ is approximately zero. Second, we measure the change in withdrawals from the year in which one turns $58\frac{1}{2}$ to the year in which one turns $59\frac{1}{2}$. The difference in this change across different quarters of reaching age $59\frac{1}{2}$ is approximately proportional to the difference in quarters. Finally, when comparing the change in withdrawals from the year in which one turns $59\frac{1}{2}$ to the year in which one turns $60\frac{1}{2}$, the difference in average annual pre-retirement withdrawals decreases approximately linearly in the difference in quarters of reaching $59\frac{1}{2}$. We can test these predictions by estimating the following regression for different values of e:

$$\triangle y_{qe} = \alpha + D_e \cdot (-365/4)\, q + \varepsilon_{qe}, \tag{9}$$

where $e \in \{-1, 0, 1\}$. Under the linearity assumption, we expect $\hat{D}_{-1} = 0$ and $\hat{D}_0 = -\hat{D}_1$.

Likewise, if we group individuals into cells by month of reaching age $59\frac{1}{2}$ and event year, and calculate the change in average annual pre-retirement withdrawals, similarly denoted $\triangle y_{me}$, we have:

$$\triangle y_{m,-1} - \triangle y_{m',-1} \approx 0$$

[5]The expressions are only approximate for two reasons. First, the error terms do not average to zero in finite samples. Second, the differences are off by as much as 2α if any of the years involved are a leap year. The former issue vanishes asymptotically, while the latter can be handled by including calendar year fixed effects in the regressions below in quations (9) and (11).

$$\begin{aligned} \triangle y_{m,0} - \triangle y_{m',0} &\approx [m' - m] \cdot (365/12) \cdot D \\ \triangle y_{m,1} - \triangle y_{m',1} &\approx -[m' - m] \cdot (365/12) \cdot D. \end{aligned} \tag{10}$$

These admit a similar regression using data grouped by month of birth:

$$\triangle y_{me} = \alpha + D_e \cdot (-365/12)\, m + \varepsilon_{me}, \tag{11}$$

with similar predictions for $\hat{D}_e$ as in the case of quarterly averages. The above can easily be reframed to estimate the effect on the probability of making a positive withdrawal.

Although these results rely on strong functional form assumptions, they deliver sharp predictions regarding year-to-year changes in annual withdrawals across different quarters and months of reaching $59\frac{1}{2}$. In particular, the above results imply that increases in annual withdrawals are roughly constant across quarter and/or month of reaching $59\frac{1}{2}$ between event years -2 and -1, are monotonically increasing in quarter and month of reaching $59\frac{1}{2}$ between event years -1 and 0, and are monotonically decreasing between event years 0 and 1. In the next section, we develop a more flexible approach, allowing nonlinearity in the function $f(\cdot)$ and arbitrary values for the $\tilde{\lambda}_d$.

4.2 Estimated Daily Event Study

Building upon the intuition in the previous section, we now relax the assumptions made about the functional form of $f(\cdot)$ and instead estimate this function using a flexible polynomial. To better parallel the structure of our tax data, we will shift time relative to age a^* and collapse data to an annual level. Let j measure age in event time, i.e. age relative to the date on which one turns $59\frac{1}{2}$. Formally, let $j \equiv d - b - a^*$. Let the mapping $t(b, e)$ be the calendar year in which someone born on day b reaches event year e. For example, $t(b = 10June1950, e = 0) = 2009$. Likewise, the mappings $\underline{d}(b, e)$ and $\overline{d}(b, e)$ are the calendar dates for January 1 and December 31 in the year $t(b, e)$.

We can now express annual pre-retirement withdrawals as follows:

$$\begin{aligned} y_{be} &\equiv \sum_{d=\underline{d}(b,e)}^{\overline{d}(b,e)} y_{bd} \\ &= \sum_{d=\underline{d}(b,e)}^{\overline{d}(b,e)} \tilde{\alpha} + \sum_{d=\underline{d}(b,e)}^{\overline{d}(b,e)} \tilde{\lambda}_d + \sum_{j=\underline{d}(b,e)-b-a^*}^{\overline{d}(b,e)-b-a^*} f(j) + \sum_{j=\underline{d}(b,e)-b-a^*}^{\overline{d}(b,e)-b-a^*} D \cdot \mathbf{1}\{j \geq 0\} + \sum_{d=\underline{d}(b,e)}^{\overline{d}(b,e)} \varepsilon_{bd} \\ &= \alpha + \lambda_{t(b,e)} + \sum_{j=\underline{d}(b,e)-b-a^*}^{\overline{d}(b,e)-b-a^*} [f(j) + D \cdot \mathbf{1}\{j \geq 0\}] + \varepsilon_{be}, \end{aligned} \tag{12}$$

where $\alpha \equiv 365 \cdot \tilde{\alpha}$ is a constant, $\lambda_t \equiv L_t \cdot \tilde{\alpha} + \sum_{d=1Jan,t}^{31Dec,t} \tilde{\lambda}_d$ is a calendar year fixed effect, L_t is an indicator for a leap year, and ε_{be} is a mean-zero error term. We fit $f(\cdot)$ with a flexible polynomial, using the specification in equation (12). In particular, we use polynomials of order one through five, and additionally allow the coefficients to differ on either side of age $59\frac{1}{2}$. Our key parameter of interest is D, which captures any sharp change in pre-retirement withdrawals (or the share making the first withdrawal of the year) upon turning age $59\frac{1}{2}$.

5 Data

Our data come from the population of tax and information returns collected by the Internal Revenue Service (IRS). We use supplementary information provided by the Social Security Administration (SSA) on date of birth, gender, and date of death to restrict our sample to individuals born between July 1, 1941 and July 1, 1951 for tax years 1999 through 2013 who are alive in the year they turn $57\frac{1}{2}$. This sample restriction ensures that our data contain tax years two years before and after each individual turns $59\frac{1}{2}$. Our dataset contains information on household income (Form 1040), wage earnings and employee contributions to employer-sponsored retirement plans (Form W2), withdrawals from IRAs and employer-sponsored retirement plans (Form 1099R), contributions to and account balances of IRAs (Form 5498), and tax amounts on early withdrawals (Form 5329). Because the data are unedited, we make

a number of restrictions in an effort to remove observations with erroneous information. We drop roughly 1.5 million observations due to death and birthdates that do not exist (e.g. September 31).

Our analysis focuses on withdrawals from IRAs due to some important data limitations. First, unlike Form 5498 which provides the fair market value of an IRA annually, there is no tax form at the individual level that reports account balances for defined contribution plans such as a 401(k). This makes it difficult to select a sample of individuals who are at risk of withdrawing funds from these accounts.[6] Second, while withdrawals from defined contribution plans are reported on 1099-R forms, they are undistinguishable from defined benefit payments. By contrast, IRA withdrawals can be separately identified due to a checkbox on the 1099-R tax form. As described in the previous section, the penalties differ somewhat for 401(k)s and IRAs, as 401(k) plans only allow hardship withdrawals prior to age $59\frac{1}{2}$, while IRAs allow withdrawals for any reason. Therefore, generalizing our results to other types of accounts should be done with caution. However, IRAs may be more typical, particularly at ages close to $59\frac{1}{2}$, since many individuals roll over their employer-sponsored retirement accounts into IRAs prior to retirement.

Our main analysis sample contains individuals who have a positive fair market value in at least one IRA as reported on Form 5498 in the year they turn $57\frac{1}{2}$. While our data are at the individual level, we collapse the data by individual date of birth to perform our analysis, which exploits variation in exposure to the penalty-free withdrawal period using variation in date of birth. Therefore, our total number of observations is 14,608 date-of-birth-by-year cells, representing 12,445,087 individuals or 36% percent of the population who attains age $57\frac{1}{2}$ in our analysis period.

Table 1 contains descriptive statistics on our sample. The data represent information from tax years in which the half-age in the column heading is attained. Just under half of

[6]The tax data do contain an indicator of whether one's current employer offers a defined contribution plan, and data on contributions made to defined contribution plans; however, both of these are noisy indicators of individuals with a positive balance.

our sample is male and almost three quarters file a joint return. The average adjusted gross income in our sample is $134,841. This value is relatively high both because we focus on those with assets in IRA accounts and those of older age. The fraction of our sample that takes withdrawals from their Traditional IRA is 7 or 8 percent prior to the tax year in which the individual turns age $59\frac{1}{2}$, then increases to the 16 and 17 percent in two years following the tax year when they turn $59\frac{1}{2}$. The amount withdrawn conditional on taking a distribution is approximately $24,000 annually. The fact that this amount does not vary markedly around the age $59\frac{1}{2}$ threshold suggests that any increase in average withdrawals occurring at the age $59\frac{1}{2}$ threshold may be more likely to be on the extensive margin. Importantly, these simple comparisons of annual withdrawals across ages do not allow identification of responses to the sharp reduction in the penalty occurring when one attains age $59\frac{1}{2}$, as these increases could simply represent gradually increasing withdrawals from retirement saving accounts. The table also shows the proportion of our sample that pays a penalty on their IRA withdrawals and the average penalty amount. Approximately 5 percent of the sample incurs a penalty during the tax year in which they turn $57\frac{1}{2}$, but this declines to 1 percent at older ages.[7]

6 Results

6.1 Annual Patterns

We first investigate how annual withdrawals vary in calendar years in which individuals attain ages $57\frac{1}{2}$, $58\frac{1}{2}$, $59\frac{1}{2}$, $60\frac{1}{2}$ and $61\frac{1}{2}$ based on the exposure to penalty-free withdrawals. This exposure depends on one's quarter or month of birth, as discussed in Section 4.1. Figure 1 shows annual withdrawals from IRAs in different calendar years by exposure to penalty-free withdrawals. The top panel groups individuals by birth quarter, while the bottom panel organizes the sample by month of birth. Individuals represented by the line corresponding

[7]The penalty represents the additional tax as reported on the 1040 which is on a household basis, and thus may include penalties incurred by a younger spouse who has not attained age $59\frac{1}{2}$.

to 4 months of penalty-free withdrawal, for example, include those who turn $59\frac{1}{2}$ between August 1 and September 1 (i.e., birthdays in February).

As shown in Panel (a) of Figure 1, the level and change in annual withdrawals between the years in which age $57\frac{1}{2}$ and age $58\frac{1}{2}$ occur are the same across different quarters of birth. However, the change in annual withdrawals begins to diverge in the year individuals turn $59\frac{1}{2}$. In particular, those who have more months of penalty-free withdrawal in the calendar year in which they turn $59\frac{1}{2}$ also have larger increases in their annual withdrawals in that calendar year. Likewise, those with the least amount of exposure to penalty-free withdrawals in the $59\frac{1}{2}$ year experience the greatest increase in exposure when moving to the year in which age $60\frac{1}{2}$ is reached. Accordingly, these groups now experience the greatest growth in annual withdrawals. By the time age $61\frac{1}{2}$ is reached, the gap between the groups has shrunk considerably, but not completely, suggesting that higher withdrawals for those who turned $59\frac{1}{2}$ earlier persist to some extent two years after the penalty is lifted. In Panel (b) of Figure 1, this exact result continues to hold if we group individuals by month of birth instead.

These figures strongly suggest that the removal of the penalty at age $59\frac{1}{2}$ is driving the patterns seen in the data and largely track the predictions made in Section 4.1, where we assume a linear relationship between withdrawals and age. In particular, the increase in withdrawals when moving from age $58\frac{1}{2}$ to $59\frac{1}{2}$ is robustly monotonic in quarters or months of exposure to penalty-free withdrawals, as is predicted in the approximations in (8) and (10). To see what magnitude of increase in withdrawals at age $59\frac{1}{2}$ is implied by the figure, we estimate equations (9) and (11) in Table 2. Assuming a linear functional form for $f(\cdot)$, we estimate a sharp increase at age $59\frac{1}{2}$ of between \$6 and \$7 in average daily withdrawals. We fail to reject the hypotheses that $D_0 = -D_1$ and $D_{-1} = 0$, both of which are predictions of the simple linear model. Overall, the patterns here are largely consistent with a discontinuous increase in withdrawals upon reaching age $59\frac{1}{2}$.

6.2 Estimated Event Study

Next we perform an event study analysis in order to trace out daily withdrawal patterns before and after individuals turn $59\frac{1}{2}$. We present estimates of the daily pattern of average withdrawals in Figure 2. The vertical axes represent average daily withdrawal amounts. We show both the point estimates and 95 percent confidence intervals. All of the specifications show evidence of a break at event time 0, which represents the day that individuals attain age $59\frac{1}{2}$ and can begin making withdrawals from their IRA without any penalty. The higher-order polynomials reveal some of the underlying features of the data to a richer extent than the linear functional form. For instance, daily average withdrawals appear to be largely flat prior to age $59\frac{1}{2}$. Thereafter, the figures show what appears to be a spike in withdrawals at age $59\frac{1}{2}$, followed by a decrease in withdrawals to a new level higher than that of prior ages. We estimate that lifting the 10 percent penalty on withdrawals leads to an increase in the average daily withdrawal of \$4.08, which implies an annual increase of \$1,489.20. This coefficient is precisely estimated and statistically different from zero.

In Table 1, we report an unconditional average annual withdrawal amount of \$1,967.41 in the calendar year individuals turn $58\frac{1}{2}$. The implied increase of \$1,573.15 per year once one reaches age $59\frac{1}{2}$ that we estimate represents roughly a 75 percent increase from this base. The increase in the average withdrawals could arise either from the extensive margin, if a larger share of individuals are taking withdrawals, the intensive margin, if the share of individuals accessing their IRAs does not change but the average amount conditional on taking withdrawals increases, or a combination of both.

There is some evidence that the increase in withdrawals represents a shift in timing from periods immediately prior to the $59\frac{1}{2}$ threshold to periods immediately afterwards. However, for up to two years after this spike, a higher level of withdrawals persists. This result suggests that increasing the liquidity of retirement saving accounts by either lowering the age threshold or reducing the penalty would potentially lead to a larger amount of money withdrawn during the years that were previously covered by the early withdrawal penalty.

In the next section, we investigate a different lever that changes the liquidity of retirement saving accounts, namely the exceptions provided that allow people to make withdrawals without incurring a penalty.

6.3 Heterogeneity and Penalty Exceptions – TBD

6.4 Placebo Analysis – TBD

6.5 Robustness Tests – TBD

7 Conclusion

Despite active research that documents pre-retirement withdrawals from retirement savings accounts, there has not been much prior work that investigates the relationship between pre-retirement withdrawal penalties and withdrawals from retirement accounts. One significant barrier to understanding the effects of these penalties on withdrawals from retirement accounts has been data limitations, as household surveys have limited sample size and potentially underreported withdrawal activity and administrative data is often collected at longer frequencies, making it difficult to uncover event studies at shorter frequencies.

This study attempts to overcome several of these shortcomings in the data by developing new empirical techniques that allow us to analyze withdrawal activity when the penalty for pre-retirement withdrawals is lifted with high-quality data from the IRS. By exploiting variation in date of birth, which leads to natural variation in exposure to penalty-free withdrawals over calendar years, we can estimate event studies that show how withdrawal behavior changes on either side of the age $59\frac{1}{2}$ threshold.

Our results indicate large changes in withdrawal behavior as a result of crossing age $59\frac{1}{2}$. In particular, we find that the average daily withdrawal increases by approximately \$4.08, implying a \$1,500 increase in annual withdrawals from IRAs, or an increase of approximately 75 percent relative to annual withdrawals prior to age $59\frac{1}{2}$. These findings suggest that the

removal of the 10 percent penalty for early withdrawals at age $59\frac{1}{2}$ does influence withdrawal behavior among individuals with IRAs.

We also investigate the heterogeneity in the response to the early withdrawal penalty and find that lower-income individuals experience larger long-run increases at the age $59\frac{1}{2}$ threshold in relative terms, though smaller increases in absolute terms. This finding may suggest that lower-income groups within our sample are more constrained by the penalty.

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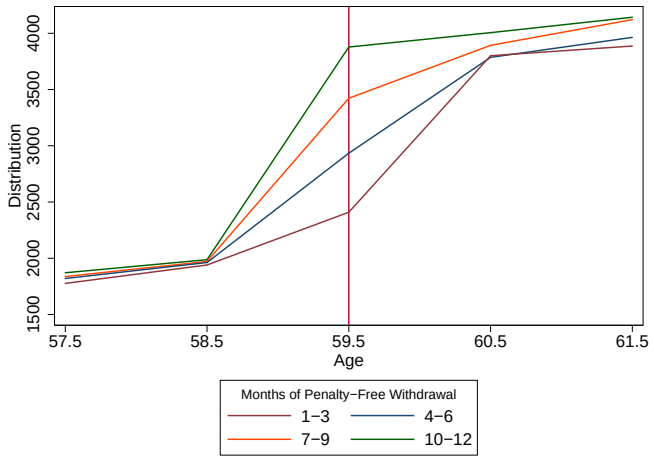
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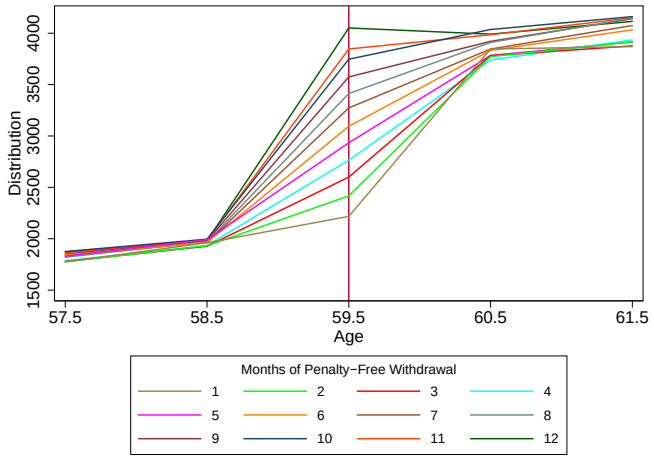
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Figure 1: Mean Annual IRA Distribution by Exposure to Penalty-Free Withdrawal

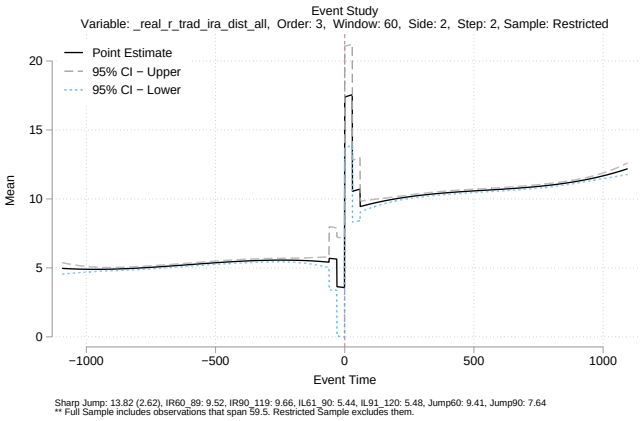


(a) Quarterly Exposure

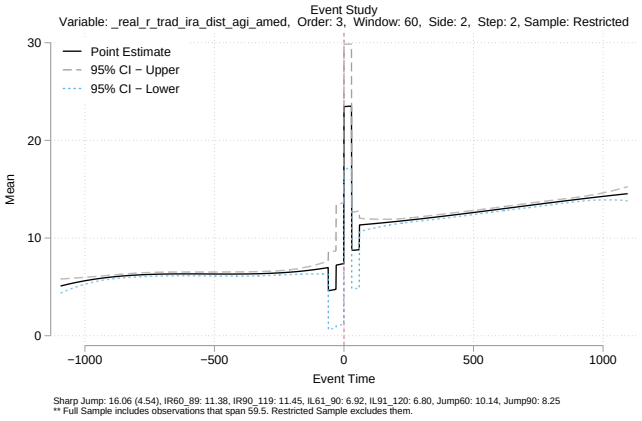


(b) Monthly Exposure

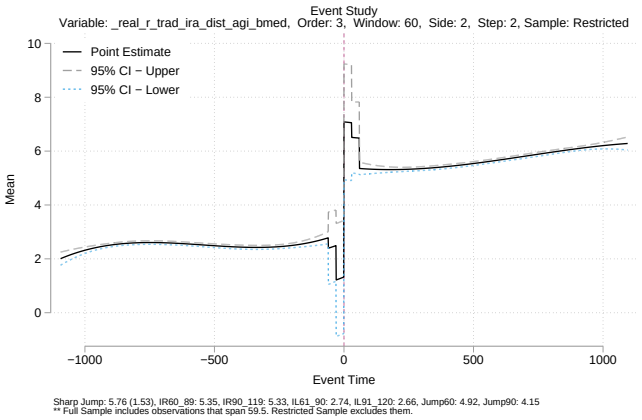
Figure 2: Average Daily IRA Withdrawals



(a) Full Sample



(b) Above Median AGI



(c) Below Median AGI

Table 1: Descriptive Statistics

	(1)	(2)	(3)	(4)	(5)
	Half-age attained during the calendar year				
	57.5	58.5	59.5	60.5	61.5
Fraction Male	0.49	0.49	0.49	0.49	0.49
Fraction Married	0.74	0.73	0.73	0.72	0.71
Traditional IRA Distribution	1827.22	1967.41	3188.56	3903.07	4081.25
Traditional Non-IRA Distribution	3892.61	4248.61	4955.11	5769.58	6207.55
Mortgage Interest (All)	5912.92	5609.80	5307.47	5324.13	4553.24
Mortgage Interest (Filers)	5048.16	4947.93	4773.65	4528.20	4259.10
Wages	47868.50	45186.34	42777.00	39808.78	37227.63
Adjusted Gross Income	134841.80	128522.28	124190.44	120452.14	117819.01
Additional Tax on IRAs	73.67	74.32	34.12	9.78	8.04
Fair Market Value of IRA	96802.69	101035.20	108727.61	112359.30	120447.29
Takes Traditional IRA Distribution	0.07	0.08	0.13	0.16	0.17
Takes Traditional Non-IRA Distribution	0.17	0.19	0.22	0.25	0.27
Has Mortgage Interest (All)	0.53	0.51	0.49	0.46	0.44
Has Mortgage Interest (Filers)	0.44	0.43	0.43	0.41	0.40
Has Wages	0.73	0.71	0.68	0.65	0.62
Has Non-Zero Adjusted Gross Income	0.96	0.95	0.94	0.93	0.92
Pays Additional Tax on IRAs	0.05	0.05	0.03	0.01	0.01
Has Non-Zero FMV on IRA	1.00	0.97	0.94	0.91	0.89
Traditional IRA Distribution (Non-Zero)	25263.76	23552.38	23555.08	23933.24	23898.01
Traditional Non-IRA Distribution (Non-Zero)	22258.54	22690.66	22683.38	22916.61	22603.59
Fair Market Value of IRA (Non-Zero)	96877.34	104078.93	115078.17	122254.66	134126.28
Number of Observations	12445149.00	12445149.00	12445149.00	12445149.00	12445149.00

Note: Individuals born between July 1, 1941 and July 1, 1951, who have a positive fair market value of a traditional IRA account in the year they turn 57.5. Data are for the years in which an individual turns 57.5, 58.5, 59.5 and 60.5 in 1999 through 2013 tax years.

Table 2: Estimated Increase in Daily Traditional IRA Withdrawals at Age $59\frac{1}{2}$ Threshold Using Annual Patterns

	(1)	(2)
	Level of Aggregation	
	Quarterly	Monthly
D_{-1}	-0.25	-0.25^{*}
	(0.22)	(0.12)
D_0	6.95^{***}	6.99^{***}
	(0.09)	(0.20)
$-D_1$	6.18^{***}	6.31^{***}
	(0.19)	(0.29)

Note: Each estimate represents the results from regressions specified according to equations (9) and (11). Under a model where daily retirement withdrawals increase linearly in age, we predict $\hat{D}_{-1} = 0$ and $\hat{D}_0 = -\hat{D}_1$.