DO “CATCH-UP LIMITS” RAISE RETIREMENT SAVING?
EVIDENCE FROM A REGRESSION DISCONTINUITY DESIGN

Adam M. Lavecchia

This paper studies the effect of raising contribution limits on retirement saving by exploiting the “catch-up limit” provision, a rule which allows those over the age of 50 to make higher IRA and 401(k) contributions than those under 50. Using an age-related regression discontinuity design, I find that eligibility for catch-up limits leads to a large increase in total tax-deferred contributions for those without access to a 401(k) plan. This is driven by a 25 percent increase in average IRA contributions and a 21 percent increase in the likelihood of making an IRA contribution. I also find no significant effects on overall 401(k) contributions. The findings suggest that, contrary to the neoclassical life-cycle model, the response to eligibility for catch-up limits was not limited to constrained savers.

Keywords: retirement saving, retirement saving, tax-preferred savings accounts, contribution limits, regression discontinuity design

JEL Codes: D14, H31, J26

I. INTRODUCTION

There is a growing concern that a significant number of households are not saving enough to smooth consumption in retirement.\(^1\) Increasing individual retirement account (IRA) and 401(k) contribution limits is often suggested as a way to increase saving.\(^2\) However, the effectiveness of this policy has been widely debated in academic

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\(^1\) See Poterba (2014) for a review of the state of retirement income security in the United States. Based on his reading of the literature, Poterba suggests that approximately 25 percent of households have not accumulated enough assets to purchase an annuity that would allow them to maintain even 50 percent of their pre-retirement consumption. He notes, however, that there is significant heterogeneity across households in retirement income security. In particular, replacement rates are relatively high for many low-income households given current expected Social Security benefits.

\(^2\) Individual Retirement Accounts (IRAs) and employer-sponsored 401(k) savings plans are the two most popular tax-preferred savings accounts. Asset balances in IRAs, more than $4.8 trillion in 2012, account for more than 25 percent of retirement wealth and 9.3 percent of household assets (Holden and Bass, 2014). 401(k) plans are the most popular employer-sponsored defined contribution plan. 401(k) balances totaled more than $4.2 trillion in 2013, almost 50 percent of private pension assets in the United States (Holden and Schrass, 2014).

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and policy circles with no clear consensus. Opponents argue that increasing the annual IRA and 401(k) contribution limit does little to promote saving by individuals for whom the limit is not already binding (Orszag and Orszag, 2001). This view is supported by the neoclassical life-cycle model of consumption and saving which predicts that raising the contribution limit will only affect the choices of previously constrained savers.

In this paper, I question whether the savings response to higher contribution limits is always limited to constrained savers. Using exogenous policy variation to IRA and 401(k) limits, I show that the effects of raising contribution limits can be more nuanced. My analysis exploits the introduction of the “catch-up limit” provision, a rule introduced in 2002 which allows individuals over the age of 50 to make larger tax-deferred contributions than those under the age of 50. The catch-up limit provision permits an age-based regression discontinuity design (RDD) which compares the annual tax-deferred contributions of those just over the age of 50 with those just under the age of 50.

Using data from the Survey of Income and Program Participation (SIPP) for 2002, 2004, and 2005, I find that eligibility for catch-up limits leads to a small and statistically insignificant effect on total tax-deferred (IRA plus 401(k)) contributions in the overall population. However, this finding masks significant heterogeneity, both across different types of individuals and between different retirement savings accounts. Eligibility for catch-up limits leads to a 25 percent increase in average IRA contributions and a 21 percent increase in the probability of contributing to an IRA at age 50. This is driven by a 51 percent increase in the average tax-deferred contribution of individuals that do not have access to an employer-sponsored 401(k) plan; the probability of making a contribution also increases by 31 percent for this group. Interestingly, this rise in participation rates is due to an increase in the likelihood of making a deductible contribution among existing owners, rather than higher take-up of IRA accounts. In contrast, eligibility for catch-up limits leads to a small and statistically insignificant change to the tax-deferred contributions of those with access to a 401(k).

The large participation response by individuals without access to a 401(k) plan is of interest because it implies that the effect of eligibility for catch-up limits was not limited to constrained savers, contrary to the predictions of the neoclassical life-cycle model. Compared with those that do have access to a 401(k) plan, individuals without access earn less, have less education, and are nearly three times more likely to work at

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3 I also explored whether eligibility for catch-up limits increases total saving (i.e., tax-deferred retirement saving plus taxable saving). Although the SIPP asks respondents about their deductible contributions to IRAs and 401(k)s, a flow measure of saving, similar questions are not asked for taxable and other non-tax deferred saving. In particular, only year-end asset balances for taxable accounts and home equity are available (a stock measure of saving). Converting these stocks to flow variables requires differencing year-end asset balances. The resulting variables are quite noisy, leading to estimates for the effect of eligibility for catch-up limits on overall saving (and crowd-out) that are very imprecisely measured. These estimates are available from the author upon request.
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a firm with fewer than 50 employees. These differences suggest that there may also be large differences in the willingness, ability, and ways in which the two groups save for retirement. In turn, this may explain the observed heterogeneous responses to eligibility for catch-up limits.

I explore two hypotheses for the divergent findings between the “no 401(k) available” and “401(k) available” groups. First, anecdotal evidence from trade magazines and journals for the financial services industry suggests that banks and credit unions may have directed the advertising for their IRA products towards those over the age of 50 after the introduction of catch-up limits. This advertising may have raised retirement contributions and participation rates by increasing awareness about the catch-up limit provision, and for retirement saving more generally. For those without access to a 401(k) plan, this advertising may have been especially helpful in the absence of other timely advice about retirement savings. Second, I explore an explanation for the small, statistically insignificant effect of eligibility for catch-up limits for individuals with access to a 401(k) plan. I find suggestive evidence that 401(k) owners constrained by the contribution limit temporarily substituted to IRAs while employers amended their pension plan contracts to accommodate catch-up limits (Kaplan, 2002). In particular, while the annual estimate of the effect of catch-up limits on IRA contributions decreases between 2002 and 2005 for 401(k) limit savers, the annual estimate for 401(k) contributions increases between 2002 and 2005.

This paper builds on the public finance literature that studies who uses tax-deferred retirement accounts, as well as on how policy changes affect saving in these plans. Some of the first estimates on the effects of raising IRA and 401(k) limits comes from counterfactual policy simulations using structural models (Venti and Wise, 1990a, 1990b; Gale and Sholz, 1994). These studies conclude that raising contribution limits leads to a large (mechanical) increase in tax-deferred contributions only for limit contributors. Using data from the Consumer Expenditure Survey (CEX) and the SIPP, Venti and Wise (1990a, 1990b) estimate that raising IRA limits leads to a large increase in annual contributions, most of which represents new saving. However, using data from the Survey of Consumer Finances and a model that allows tastes for saving to vary by IRA contributor status, Gale and Sholz (1994) estimate that only a small fraction of the increase in contributions following a limit change represents new saving. These starkly different findings may be due to differences in econometric assumptions: the estimation in Venti and Wise (1990a, 1990b) assumes that differences in IRA saving across households is random after controlling for household characteristics, while Gale

4 A large and growing literature in behavioral economics explores whether non-price mechanisms increase saving. Several papers have found that policies such as default options (Madrian and Shea, 2001; Choi, Laibson, and Madrian, 2004) requiring active decisions (Carroll et al., 2009), salience (Duflo et al., 2006; Duflo et al., 2007; Saez, 2009; Chetty et al., 2014), the actions of agents in an advisory capacity (Duflo et al., 2007), reminders (Karlan et al., 2010), and informational nudges (Clark, Maki, and Morrill, 2014) can be effective at increasing saving.
and Scholz compare IRA limit contributors, non-limit contributors, and households that do not own IRAs.⁵

These mixed findings led to the development of a large literature in public finance that estimates whether IRA and 401(k) contributions displace saving in taxable assets (Feenberg and Skinner, 1989; Poterba, Venti, and Wise, 1995; Joines and Manegold, 1995; Attanasio and DeLeire, 2002; Benjamin, 2003; Engelhardt and Kumar, 2007; Gelber, 2011).⁶ While the evidence in these papers has improved our understanding of who uses IRAs and 401(k)s, the empirical strategies used are faced with important limitations (Bernheim, 2002; Friedman, 2016). These limitations are due to the fact that IRA and 401(k) contribution limits are rarely exogenous. Historically, eligibility for IRAs and 401(k)s has either been universal or correlated with potential tastes for saving such as income or workplace pension status.⁷ Direct empirical evidence on the causal effect of raising contribution limits is especially scarce, in part because changes to statutory limits are infrequent. Interpreting evidence that compares IRA or 401(k) contributors before and after a limit increase is difficult if changes to unobservables that influence retirement savings are correlated with the limit increase. For example, differences in economic conditions over time make it difficult to interpret changes to savings behavior before and after a contribution limit increase as a causal effect without an unaffected control group.

The RDD used in this paper addresses and improves upon the limitations of prior work by allowing for a cleaner identification of the savings effect of raising contribution limits. This is because the validity of the RDD relies only on the assumption that all unobserved characteristics that influence savings are continuous in age at age 50.

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⁵ In the Canadian setting, Milligan (2003) studies a reform that increased contribution limits for Registered Retirement Savings Plans (RRSPs), an account similar to IRAs. He finds that increases in future contribution limits lower current period contributions. Milligan (2003) reconciles these findings with a model in which savers who expect their desired retirement account contributions to be constrained in the future shift some of their savings to the current period. For these savers, increasing future contribution limits relaxes the future constraint, leading to lower contributions in the current period.

⁶ In the Danish setting, Chetty et al. (2014) show that the overall savings effect of retirement accounts depends on whether individuals are active or passive in their savings allocation decisions. For those that are passive (about 85 percent of the sample), mandatory savings policies increase savings since individuals do not re-optimize by reducing saving in other accounts. Tax incentives to save in retirement accounts also have little effects on this group. For those that are active optimizers (about 15 percent of the sample), tax-incentives to save lead to reductions in other taxable saving, limiting the overall savings impact of these plans.

⁷ Strategies that exploit within-person changes in IRA or 401(k) contributor status require that the time varying unobservable characteristics that influence saving evolve similarly for those whose contributor status switches and those whose does not. Significant differences in observables between these two groups may be indicative that unobservable tastes for saving also evolve differently over time. For example, in Attanasio and DeLeire (2002), new IRA contributors are younger, have lower income, lower levels of financial assets, and fewer children (on average) than continuing contributors. In Gelber (2011), employees newly eligible to participate in a 401(k) are younger, have lower income, less liquid and illiquid financial assets have less debt (both secured and unsecured), on average, than employees who have always been eligible for their firm’s 401(k) plan.
In Sections III and IV, I present evidence to support the plausibility of this identification assumption. In particular, using savings behavior from the years prior to the introduction of catch-up limits, I test whether IRA and 401(k) contributions are continuous at age 50. Reassuringly, I find no evidence that contributions or the probability of making a positive contribution are discontinuous at age 50 before the adoption of catch-up limits. This implies that the tax-deferred savings behavior of those just under the age of 50 is a valid counterfactual for the choices of those just over the age of 50.

In a paper that complements this research, Routledge, Wu, and Vitagliano (2014) compare the savings of 401(k) limit contributors with the savings of non-limit contributors (between the ages of 46 and 53) before and after the adoption of catch-up limits. Using a difference-in-differences research design, they find that those constrained by the 401(k) limit prior to the adoption of catch-up limits made larger contributions after 2002. The main difference between this paper and Routledge, Wu, and Vitagliano (2014) is that I analyze the effect of eligibility for catch-up limits on total tax-deferred (IRA plus 401(k)) contributions for all individuals, whereas the latter paper focuses on the 401(k) contributions of constrained savers. This difference is important because of the large participation response and tax-deferred contribution increase I find among those without access to a 401(k) plan. By analyzing the effect of eligibility for catch-up limits on all savers and for both types of plans, I am able to capture the full effect of the provision on tax-deferred retirement saving.

The remainder of the paper is organized as follows. Section II describes the catch-up limit provision. In Section III, I describe the data and the empirical strategy. Section IV reports the main results for IRAs, 401(k)s, and total tax-deferred saving, while Section V discusses the heterogeneity of the main results and several mechanisms that may underlie the empirical findings. Section VI discusses the policy implications of the results and provides concluding comments.

II. INSTITUTIONAL BACKGROUND

A. EGTRRA and the “Catch-up Limit” Provision

This section describes the catch-up limit provision, an IRA and 401(k) contribution rule introduced as part of the Economic Growth and Tax Relief Reconciliation Act (EGTRRA). In the empirical analysis, I exploit the sharp differences to individual IRA and 401(k) limits induced by this provision to recover an estimate of the causal effect of increasing contribution limits on retirement saving. Along with Social Security benefits, IRAs and 401(k)s account for the vast majority of retirement income for most Americans. Contributions to both of these accounts are tax-deductible in the year the

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contribution is made (up to an annual limit). For 401(k)s, employee contributions are often supplemented by matching employer contributions up to a maximum percentage of earnings or a fixed dollar amount (Benartzi and Thaler, 2007; Carrol et al., 2009). Interest earned on assets held in IRAs and 401(k)s accumulates tax-free. With some exceptions, withdrawals are subject to a 10 percent penalty for savers younger than 59.5 years of age.

The EGTRRA enacted several reforms ranging from reductions in marginal income tax rates to changes in estate and gift tax regulations. It also legislated changes to retirement savings plans, including IRAs and 401(k)s. For example, the EGTRRA introduced the Saver’s Credit, a non-refundable tax credit for certain low-income savers. The EGTRRA also allows individuals to transfer in-kind (rollover) assets from one workplace pension to another 401(k) or IRA. The focus of this paper, however, is on the contribution limit increases that EGTRRA legislated over the 2000s. The IRA contribution limit was increased for the first time since 1981; from $2,000 in 2001 to $3,000 in 2002–2004, $4,000 for 2005–2007, and $5,000 from 2008 onwards. Similar contribution limit increases were implemented for 401(k)s, though initial contribution limits were much higher.

The EGTRRA also introduced the catch-up limit provision, a rule that allows individuals over the age of 50 to make larger IRA and 401(k) contributions than those under the age of 50. Beginning in 2002, individuals who turn 50 years old (or older) by the end of the calendar year are eligible for catch-up limits; eligibility is therefore a deterministic function of an individual’s year of birth. Catch-up limits are intended to provide a way for older workers who previously had not saved sufficiently for retirement, an opportunity to “catch-up” (H.R. Rep. No. 107-51). For IRAs, the provision allowed eligible taxpayers to contribute an additional $500 annually from 2002 to 2005 and $1,000 annually from 2006 onwards. Eligibility for catch-up limits does not depend on whether a household files their tax return individually or jointly. Individuals are not permitted to carry-forward unused contribution limits to future years. Importantly,
catch-up limits are the only provision in the EGTRRA which differentially affected individuals around age 50. This improves our confidence that any differences between the savings behavior of those just over and under the age of 50 following the adoption of catch-up limits is due to this provision and not other provisions in the EGTRRA.

B. Predicting Behavioral Responses to the “Catch-up Limit” Provision

Neoclassical economic theory predicts that raising contribution limits will only affect constrained individuals, those already making the maximum allowable IRA or 401(k) contribution. This led some to be skeptical about whether the catch-up provision could increase retirement saving for families with little initial savings (Orszag and Orszag, 2001). One prediction of the neoclassical theory is that the introduction of catch-up limits should not increase IRA or 401(k) participation rates (the likelihood of making a contribution). Simply raising the contribution limit should not induce individuals to begin participating in a retirement savings plan if they previously were not contributing. However, this model makes a number of implicit assumptions about individual savings behavior. For example, it assumes that IRA and 401(k) contributions are viewed as perfect substitutes and that individuals are fully informed about the benefits and costs of contributing to tax-deferred plans. If these assumptions do not hold, then the savings response to catch-up limits may differ significantly from the predictions of this stylized model. In the results reported later, I find that the likelihood of making a deductible IRA contribution increased for individuals at age 50 following the adoption of catch-up limits, suggesting that the behavioral response was not limited to constrained savers.

Whereas some analysts were skeptical that catch-up limits could increase retirement saving, many in the popular media and financial planning community praised the provision as a way to help procrastinators. For example, a March 2001 *Sun-Sentinel* newspaper article describes the catch-up limit provision in the following way: “These provisions would be a boon to those Baby Boomers who just turned 50 and haven’t saved diddly, to stay-at-home moms re-entering the workforce, or to working parents who finally got their kids in college and need to attend to their own needs” (Cruz and Lade, 2001). The idea that eligibility for catch-up limits could increase retirement account participation rates or increase in saving for those not constrained by the initial limit offers a competing prediction for the effect of this provision on IRA and 401(k) savings behavior.

III. DATA AND EMPIRICAL STRATEGY

A. Data

Estimating the effect of eligibility for catch-up limits on retirement saving requires individual-level information on IRA and 401(k) contributions and year of birth. The SIPP is well-suited for this analysis because it provides detailed information on retire-

13 The *Sun-Sentinel* is the main newspaper for the Broward and South Palm Beach counties in Florida.
ment account ownership, contributions, and asset balances, as well as relatively large sample sizes. Individuals and households in each SIPP panel are interviewed every four months (waves) for a period of three to four years. In this paper, I pool several cross-sections (waves) from the 1996, 2001, and 2004 SIPP panels. Information from the 1996 panel and waves 1 to 4 of the 2001 panel are used to analyze the savings behavior of individuals in the years prior to the EGTRRA (the 1996–1998 and 2001 calendar years). Data from waves 5 to 9 of the 2001 panel and the 2004 panel are used for the post-EGTRRA analysis.

Questions about IRA and 401(k) ownership and contributions are asked in waves 4, 7, and 10 (where available). This timing implies that respondents are asked about their tax-deductible contributions during the January to April period for the preceding calendar year. This coincides with tax-preparation season, the period when most contributions are made. For IRAs, the questions are: (i) “Do you have an Individual Retirement Account, that is, an IRA, in your own name?”; (ii) “Did you make any tax-deductible contributions to IRA accounts which applied to your 200X (199X) tax return?”; and (iii) “How much were your tax-deductible contributions to IRA accounts, which applied to your 200X (199X) tax return?” Similar questions are asked for 401(k)s. I use the response to question (i) to examine IRA and 401(k) ownership, while information from questions (ii) and (iii) are used to examine retirement account participation, and contribution behavior. In order to explore the heterogeneous responses to eligibility for catch-up limits, I also use information on the availability of a 401(k) plan at a respondent’s current employer.

As described earlier, eligibility for catch-up limits in any given year is determined by an individual’s year of birth. Using the respondent’s date of birth recorded in the SIPP, I construct an (end of calendar year) “age” variable for each individual-year observation. Specifically, for individual \( i \) in year \( t \), “age” is defined as: \( \text{age}_i = t - \text{YOB}_i \). Those whose “age” is 50 or greater after 2002 are eligible to make catch-up contributions.\(^{15}\)

Finally, I make some sample restrictions that are common in the literature. First, I restrict the analysis to individuals between the ages of 18 and 65 in any particular year. Restricting the sample to working-age adults leaves 118,782 individual-year observations in the pooled post-EGTRRA sample. Next, I exclude all individuals that do not answer either the IRA or 401(k) ownership question. In Online Appendix Table A2, I confirm that non-response rates do not vary discontinuously at age 50. This ensures that individuals just over and under the age of 50 in the analysis sample are comparable. This restriction leads to a final analysis sample of 108,954 individual-year observations spanning the 2002, 2004, and 2005 calendar years.

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\(^{14}\) The 1996 SIPP panel surveys households for a period of four years from 1996 to 1999 (12 waves) while the 2001 and 2004 panels cover a period of three years (9 waves).

\(^{15}\) In a robustness check reported in Online Appendix Table A9, I explore the sensitivity of the results to using an individual’s age in quarters as the RDD running variable. Coefficient estimates for the effect of eligibility for catch-up limits on tax-deferred retirement contributions are nearly identical to the ones using age in years reported later.
Since some individuals in the analysis sample respond to only the IRA ownership question or only the 401(k)-ownership question, an estimate of their contribution to the account they did not respond to is required. For simplicity, I assume that contributions are zero for those in the analysis sample whose contributions are unknown. Since non-response does not vary discontinuously at age 50 (Online Appendix Table A2), this does not affect the estimate for the effect of eligibility for catch-up limits, but does decrease the precision of the coefficient estimate. As a robustness check, Online Appendix Table A8 confirms that the main results are robust to including only individuals that respond to both the IRA and 401(k) ownership questions in the analysis sample. Also, in any given year, between 6 and 10 percent of IRA contributors report tax deductible contributions that are above the annual limit; in some cases, thousands of dollars above the limit. This may be because some SIPP respondents do not distinguish between their tax-deductible contribution and rollovers into their IRA from other retirement accounts. In all such cases, I assume that the respondent’s contribution is the maximum for that year.\(^{16}\) Finally, I inflate all dollar amounts to 2010 dollars using the Bureau of Labor Statistics CPI Inflation Calculator.

Column 1 of Online Appendix Table A1 reports sample means for the pooled post-EGTRRA sample, while columns 2 and 3 show means for the sub-samples of IRA and 401(k) owners. There are several differences in the demographic characteristics and annual savings behavior of these groups. For example, 22 percent of individuals own an IRA and only 25 percent own a 401(k). Moreover, the average annual level of saving in these plans is quite low, suggesting that many Americans do not accumulate large amounts of financial assets for retirement. This finding is consistent with previous research (Venti and Wise, 1990a; Holden et al., 2005; West, 2006).\(^{17}\) IRA owners are older, more likely to be white, and are more educated than both the overall population and 401(k) owners. This heterogeneity in the taste and ability to save is what has made identifying the causal effect of tax-preferred savings accounts so difficult. Consistent with previous research, the likelihood of making a deductible contribution is quite small, even among IRA owners (Holden et al., 2005; Holden and Bass, 2014). Only 26 percent of IRA owners (6 percent of the full sample) make a deductible contribution in a given year.

Figure 1A shows the distribution of IRA contributions (for those making a positive contribution) separately for those under and over age 50 in the pre- and post-EGTRRA periods. In the pre-reform period, the vast majority of IRA contributors are constrained by the $2,000 limit, as demonstrated by the large spike in the distribution. Fewer contributors are constrained by the limit in the post-EGTRRA years. Interestingly, after 2002 there is still a large spike in the distribution at $2,000 for both those over and

\(^{16}\) I check that the probability of reporting a contribution above the limit does not vary discontinuously at age 50. Also, all results below are robust to: (a) doing the analysis on the raw (unadjusted) data and (b) dropping the individuals that report a contribution above the limit. No individuals report a 401(k) contribution above the tax-deductible limit.

\(^{17}\) For example, the mean (median) IRA contribution among positive contributors is $2,684 ($2,539) in the post-EGTRRA years. These figures are nearly identical to the mean (median) of $2,700 ($2,500) for the 2004 tax year reported by Holden et al. (2005).
Figure 1A
Distribution of IRA Contributions

Pre-EGTRRA Under 50
Pre-EGTRRA Over 50
Post-EGTRRA Under 50
Post-EGTRRA Over 50

IRA Contributions
0 1000 2000 3000 4000 5000

Frequency
0 1000 2000 3000 4000 5000
Figure 1B
Distribution of 401(k) Contributions

Pre-EGTRRA Over 50

Pre-EGTRRA Under 50

Post-EGTRRA Over 50

Post-EGTRRA Under 50
Figure 1C
Distribution of Total Deferred Account (IRA + 401(k)) Contributions

Notes: All dollar amounts are inflated to 2010 dollars using the Bureau of Labor Statistics Inflation Calculator. The sample is all individuals in the 1996, 2001, and 2004 SIPP panels that respond to the IRA or 401(k) ownership questions. The top panel of each figure shows the distribution of reported tax-deductible contributions (for positive contributors) for the Pre-EGTRRA years (1996–1998, 2001). The bottom panel shows the distribution of reported tax-deductible contributions (for positive contributors) for the Post-EGTRRA years (2002, 2004–2005).
under the age of 50. This observation is consistent with the inertia in retirement savings behavior that is well documented in the literature (Madian and Shea, 2001; Choi, Laibson, and Madrian, 2004; Chetty et al., 2014).

### B. Empirical Strategy

One of the challenges of identifying the causal savings effect of tax-advantaged accounts is finding exogenous variation in the eligibility of individuals to participate in these plans. Before describing the identification strategy used in this paper, it is useful to consider the “ideal experiment” to analyze the savings effect of an increase in the contribution limit. Such an experiment would either randomly assign contribution limits to a sample of individuals or increase the contribution limit for some, leaving the initial limit unchanged for others. Differences in contributions could then be interpreted as the causal effect of changing the limit.

In the United States, however, most changes to IRA and 401(k) eligibility has either been universal or correlated with potential determinants of individual tastes for saving, such as workplace pension status or AGI. In this paper, I use quasi-experimental variation in contribution limits induced by the catch-up limit provision to identify the causal effect of a limit change on IRA and 401(k) saving.

I estimate the effect of eligibility for catch-up limits on IRA and 401(k) contributions using a (sharp) RDD. The RDD identifies the local (treatment) effect of eligibility for catch-up limits by comparing the IRA and 401(k) contributions of individuals just above age 50 with those just below age 50. The identification assumption required by the RDD is that counterfactual retirement account contributions (i.e., the contributions in the absence of a differential change in the limit) is continuous in age at age 50. Although this assumption is not directly testable, I present evidence later that supports its plausibility.

The RDD mimics the ideal experiment by modelling retirement account contributions as a function of age and testing whether contributions increase discontinuously at age 50. If the RDD identification assumption is valid, individuals just over and under age 50 are comparable and the age-50 cutoff for catch-up limits is as good as randomly assigned.18 The RDD is also an attractive research design in this setting because it does not require panel data. In particular, if the identification assumption holds, individuals just below 50 are a valid control group for those just over age 50, so it is not necessary to follow the same individuals over time.

The estimating equation for the RDD is

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R_i = \alpha + \beta_{over50_i} + \phi_{age_i} + \theta_{over50_i \cdot age_i} + Z_i'\Gamma + \delta_i + u_i,
\]

where \(R_i\) denotes the deductible IRA (or 401(k)) contributions of individual \(i\), \(over50_i\) is a dummy variable equal to one if the individual is eligible for “catch-up limits,” \(age_i\) is

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18 See Lee and Card (2008) and Lee and Lemieux (2010) for a formal, but accessible discussion of the assumptions underlying the RDD. Dong (2015) discusses how the estimate Local Average Treatment Effect (LATE) identified by RDDs may be biased if there are rounding errors in the running variable.
the normalized assignment variable, \( Z_i \) is a vector of covariates, \( t \) are year fixed effects, and \( u_i \) is the residual.\(^{19}\) The inclusion of covariates and year fixed effects in equation (1) is not required for identification but appear in some specifications to improve precision. The baseline covariates are: a set of race dummies (white, black, and Hispanic (the excluded category is Asian/other)), demographic dummies (female and married), number of children under the age of 18, (individual) earnings (deflated to 2010 dollars), as well as a set of education dummies. In specifications without covariates, the parameter \( \alpha \) is an estimate of the counterfactual level of contributions at age 50 (those just below the cutoff). The parameter \( \beta \) captures the casual effect of being eligible for catch-up limits on contributions or participation rates. All regressions weight observations by the inverse sampling probabilities (person weights) provided in the SIPP.\(^{20}\) Following Lee and Card (2008), standard errors are clustered at the birth-cohort (birth year) level.

The parameter \( \beta \) is a local intent-to-treat (ITT) estimate of the effect of eligibility for catch-up limits on retirement saving (a policy effect). Regression discontinuity designs only identify causal effects in a neighborhood of the assignment cutoff. Therefore, \( \beta \) captures the causal effect of eligibility for a limit change on individuals at a prime savings age. This estimate should be thought of as an ITT because some individuals may have been unaware of their eligibility for catch-up limits in the years immediately following the introduction of the provision.

\( \beta \) also incorporates the potential dynamic responses by individuals both over and under 50. For example, those under the age of 50 could delay planned contributions until they become eligible to make larger contributions, as in Milligan (2003). However, most pre-EGTRRA IRA contributors were constrained by the limit (see Figure 1), suggesting that the group of savers who might delay contributions because they were both unconstrained before the EGTRRA and expected to be constrained in the future is likely small. Moreover, the “use-it-or-lose-it” motivation described in Milligan (2003) does not predict an increase in participation rates, and delaying planned IRA or 401(k) contributions would mean foregoing the benefit from the tax-free accumulation of interest.

Alternatively, savers who planned to make retirement account contributions in their late 50s may have been induced to bring these contributions forward in response to eligibility for catch-up limits. As a result, some increases to IRA or 401(k) contributions immediately following the reform may have crowded-out future contributions. Recent research finds, however, that many individuals fail to respond to even contemporaneous changes in incentives to save in retirement accounts (Chetty et al., 2014). Therefore, any potential dynamic responses to the reform may be small.

In RDDs it is standard to investigate whether there is manipulation of the assignment variable. In this application, such manipulation is unlikely since eligibility for catch-up limit is a deterministic function of an individual’s year of birth. Since deductible IRA and 401(k) contributions are claimed when filing income taxes, individuals would have to lie

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19 Recall that age is defined as the age of an individual at the end of the calendar year. As is standard in RDD, this variable is normalized so that 0 denotes individuals that are 50 years old.

20 Ordinary least square (OLS) estimates (without weights) are available upon request. The weighted and unweighted estimates are qualitatively and quantitatively similar.
about their age to the IRS in order to manipulate the assignment variable. Nonetheless, Online Appendix Table A2 investigates this possibility by checking whether the probability of responding to the IRA or 401(k) ownership questions, and therefore being included in the analysis sample, varies discontinuously at age 50. While 91.3 percent of those just under age 50 respond to one of the two ownership questions, those just over age 50 are only 0.4 percent more likely to respond. This difference is not statistically significant. Online Appendix Figure A1 tests for discontinuities in other baseline covariates. Reassuringly, almost all covariates are smooth around the age 50 threshold. The one exception is the college completion dummy variable. Individuals just over the age of 50 are approximately 3 percentage points more likely to have a college degree than those just under the age of 50. If college completion is positively correlated with tastes for saving (perhaps due to increased financial literacy or smaller discount rates), then estimates of $b$ may be biased upward. In the main results noted later, however, I show that the inclusion of this covariate does not impact the estimates of $b$ either qualitatively or quantitatively.

IV. THE EFFECT OF ELIGIBILITY FOR “CATCH-UP LIMITS” ON RETIREMENT SAVING

This section reports estimates of the effect of raising contribution limits on saving in retirement accounts. In Subsection IV.A, I present estimates of the effect of eligibility for catch-up limits on unconditional IRAs, 401(k)s, and total tax-deferred (IRA plus 401(k)) contributions. In Subsection IV.B, I analyze the effect of eligibility for catch-up limits on tax-deferred account ownership and participation rates (the likelihood of making a contribution). Subsection IV.C concludes with a discussion of the intensive margin (effect of catch-up limits conditional on contributing) results.

A. Contributions

Figure 2 illustrates the RDD by plotting IRA contributions against age. Each circle represents the mean IRA contribution for a given age bin. A local linear regression (linear spline) is estimated on each side of the cutoff for individuals between the ages of 40 and 59. The solid lines represent the fitted values from these regressions and the dashed lines are the corresponding 95 percent confidence intervals. Figure 2A plots (unconditional) average IRA contributions against age for the pre-EGTRRA years, while Figure 2B plots the same relationship for the post-EGTRRA years. Online Appendix Figures A2–A7 plot the same relationships for 401(k) contributions and total tax-deferred (IRA plus 401(k)) contributions.

---

21 Online Appendix Table A3 formally tests this by estimating linear splines for the various covariates for individuals within 10 years of the cutoff.

22 Online Appendix A reports several robustness checks including showing the sensitivity of the main results to: the chosen bandwidth, placebo tests that randomly assign the cutoff to ages other than age 50, and a difference-in-differences design. Online Appendix Tables A16 and A17 replicate the main results in Tables 1 and 2 using data from the CEX.
Notes: All dollar amounts are inflated to 2010 dollars using the Bureau of Labor Statistics Inflation Calculator. The sample is all individuals between the ages of 40 and 59 that respond to either the IRA or 401(k) ownership questions in the relevant years. Contributions for those that do not respond to one of the two ownership questions are coded as zero.
The identification assumption for the RDD requires that tastes for saving be continuous in age at age 50 in the absence of catch-up limits. While there is no theoretical reason why savings would increase or decrease discontinuously at age 50, if this age is “special” for any reason, the identification assumption is violated. One way to test the plausibility of this assumption is to check whether contributions “jump” at age 50 in the years before catch-up limits are introduced. Figure 2A illustrates this placebo test; there is no evidence of a discontinuity at age 50. Consistent with a large response to the introduction of catch-up limits average IRA contributions jump significantly, from approximately $110 to $145, in the post-EGTRRA years (Figure 2B).

This relationship is estimated formally using equation (1) and the results are reported in panel A of Table 1. A local linear regression is estimated on each side of the cutoff, allowing the effect of age on saving to vary for those over the age of 50. The local linear regressions use data from individuals between the ages of 40 and 59 (a bandwidth of 10 on each side of the age 59 cutoff). In column 1, the estimate for $a$, the counterfactual level of IRA contributions at age 50, is $111. The estimate for $b$ suggests that eligibility for catch-up limits increases (unconditional) average IRA contributions by $34, or by about 30 percent relative to those just under the age of 50. This estimate is statistically significant at the 1 percent level and is unaffected by the inclusion of year fixed effects (column 2) and the baseline covariates (column 3), although precision improves.

In contrast to the results for IRA contributions, the coefficient estimates in panel B of Table 1 suggest that average unconditional 401(k) contributions do not increase significantly at age 50. I estimate that eligibility for catch-up limits reduces 401(k) contributions at age 50 by a statistically insignificant $15 (column 1). The standard error for this coefficient estimate is large ($105), suggesting that estimates much larger or smaller than –$15 cannot be ruled out. As is the case with IRA contributions, the inclusion of year fixed effects (column 2) and covariates (column 3) does not affect the baseline estimate, although the standard errors do decrease somewhat.

In panel C of Table 1 I explore whether eligibility for catch-up limits increases total tax-deferred (IRA plus 401(k)) contributions. Across all specifications, the coefficient estimate for $b$ is small in magnitude and statistically insignificant. For example, in column 1, the average total tax-deferred contribution for those just under age 50 is $1,008. Eligibility for catch-up limits increases retirement account contributions by a statistically insignificant $19. Overall, the evidence from Table 1 indicates that eligibility for

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23 This relationship is estimated formally using equation (1) in Online Appendix Table A4. The RDD estimate is –$5 and is not statistically significant.

24 Online Appendix Table A10 tests whether the age profile of IRA contributions and participation rates (i.e., the slopes of Figures 2 and 3) become flatter before and after EGTRRA. For both contributions and participation rates, I find evidence that the age profile of IRA saving flattens post-EGTRRA, though statistical significance depends on the inclusion of covariates. Importantly, estimates for the effect of eligibility for catch-up limits remain unchanged in these specifications.

25 Online Appendix Figure A8 shows that the main results do not vary with the choice of bandwidth, for both IRA and 401(k) contributions. Consequently, all the results in the main text use an age bandwidth of 10.
### Table 1
The Effect of Eligibility for Catch-up Limits on Retirement Account Contributions

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. IRA Contributions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>over50</td>
<td>34.32</td>
<td>34.70</td>
<td>28.76</td>
</tr>
<tr>
<td></td>
<td>[10.22]***</td>
<td>[7.31]***</td>
<td>[7.04]***</td>
</tr>
<tr>
<td>Control mean</td>
<td>111.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[5.98]***</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. 401(k) Contributions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>over50</td>
<td>–14.40</td>
<td>–9.80</td>
<td>–45.33</td>
</tr>
<tr>
<td></td>
<td>[105.24]</td>
<td>[38.18]</td>
<td>[34.03]</td>
</tr>
<tr>
<td>Control mean</td>
<td>896.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[82.29]***</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C. Total Tax-Deferred (IRA + 401(k)) Contributions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>over50</td>
<td>19.38</td>
<td>24.90</td>
<td>–16.57</td>
</tr>
<tr>
<td></td>
<td>[112.46]</td>
<td>[39.92]</td>
<td>[34.93]</td>
</tr>
<tr>
<td>Control mean</td>
<td>1,007.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[84.42]***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: All dollar amounts are inflated to 2010 dollars using the Bureau of Labor Statistics CPI Inflation Calculator. The sample is individuals between the ages of 40 and 59 in the 2001 and 2004 SIPP panels that responded to either the IRA or 401(k) ownership questions (spanning the 2002, 2004, and 2005 calendar years). The dependent variable in panel A is a respondent’s reported deductible IRA contribution. In panel B the dependent variable is the respondent’s reported deductible 401(k) contribution; in panel C it is the sum of the respondent’s IRA and 401(k) contribution. Contributions for those that do not respond to one of the two ownership questions is coded as a zero. The independent variable of interest, over50, is a dummy variable equal to one if a respondent will be 50 or older by the end of the calendar year, zero otherwise. The specification in column 1 is from a regression of outcomes on a polynomial of degree 1 that is allowed to vary on either side of the cutoff. The specification in column 2 adds year fixed effects to the specification in column 1. The specification in column 3 adds the following covariates: white, black, Hispanic, female, married, personal earned income, number of kids under the age of 18, and three education attainment dummies. Each observation is weighted by its inverse sampling probability in the SIPP. Standard errors (brackets) are clustered at the birth cohort (year) level. *** p<0.01, ** p<0.05, * p<0.1.
catch-up limits has no statistically significant effect on total tax-deferred contributions. However, given that IRA contributions do increase significantly at age 50, it may be the case that total tax-deferred contributions do increase for some sub-samples of the population. I investigate this possibility in Section V.

B. Ownership and Participation Rates

I also investigate whether eligibility for catch-up limits affects the likelihood of owning an IRA or 401(k) and the likelihood of making a tax-deductible contribution. Panel A of Table 2 reports estimates of the effect of eligibility for catch-up limits on account

<table>
<thead>
<tr>
<th>Table 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Effect of Eligibility for Catch-up Limits on Retirement Account Ownership and Participation Rates</td>
</tr>
<tr>
<td>(1)</td>
</tr>
<tr>
<td>IRA</td>
</tr>
<tr>
<td>over50</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

B. Participation (Contribution) Rates

| over50 | 0.014 | –0.019 | –0.005 | –0.000 |
| | [0.004]*** | [0.006]*** | [0.007] | [0.002] |

Control mean: Ownership

| Control mean: Participation rates | 0.270 | 0.341 | 0.478 | 0.133 |

Control mean: Participation rates | 0.067 | 0.182 | 0.234 | 0.016 |

Observations | 54,748 | 54,748 | 54,748 | 54,748 |

Notes: The sample is individuals between the ages of 40 and 59 in the 2001 and 2004 SIPP panels that responded to either the IRA or 401(k) ownership questions (spanning the 2002, 2004, and 2005 calendar years). In panel A, the dependent variable is a dummy variable equal to 1 if a respondent reports owning a particular retirement account. The dependent variable in panel B is a dummy variable equal to 1 if a respondent reports making a contribution to a particular retirement account. The account ownership and contribution status of those that do not respond to one of the two ownership questions is coded as zero. The independent variable of interest, over50, is a dummy variable equal to one if a respondent will be 50 or older by the end of the calendar year, zero otherwise. All specifications regress outcomes on a polynomial of degree 1 that is allowed to vary on either side of the cutoff. Each observation is weighted by its inverse sampling probability in the SIPP. Standard errors (brackets) are clustered at the birth cohort (year) level. *** p<0.01, ** p<0.05, * p<0.1.
ownership. In column 1, the dependent variable is an indicator variable equal to one if the respondent owns an IRA and zero otherwise. Eligibility for catch-up limits does not have a statistically significant effect on IRA ownership rates; the coefficient estimate for $\beta$ is 0.001 (standard error 0.009). However, the likelihood of owning a 401(k) plan decreases by 2.3 percentage points or 6.5 percent (column 2). Eligibility for catch-up limits does not affect the likelihood of owning any retirement account (column 3) or the likelihood of owning both accounts (column 4). Figure 3 plots the fraction of individuals making a deductible IRA contribution against age. The dependent variable is equal to one if the respondent reports making a deductible IRA contribution and is equal to zero otherwise. Figure 3A illustrates the placebo test for whether IRA participation rates “jump” at age 50 before catch-up limits are introduced. As is the case with contributions, I cannot reject the null hypothesis that the IRA participation rate is continuous in age at age 50 in the pre-EGTRRA years (statistically insignificant point estimate of –0.005 for $\beta$ (standard error 0.005)). During the post-EGTRRA years, however, the likelihood of making a deductible IRA contribution increases by about 1.5 percentage points from approximately 6.5 to 8.0 percent at age 50.

The estimate for $\beta$ in panel B of Table 2 (column 1) implies eligibility for catch-up limits increases the likelihood of making an IRA contribution by 1.4 percentage points (21 percent relative to the control mean of 6.7 percent), an estimate that is statistically significant at the 1 percent level. Similar to the findings for ownership rates, eligibility for catch-up limits leads to a small decline in 401(k) participation rates (column 2), but has no statistically significant effect on overall retirement account participation rates.

The neoclassical consumption and savings model predicts that only those constrained by pre-EGTRRA contribution limits should be affected by the introduction of catch-up limits. Interestingly, the increase in IRA participation rates suggests that the response to eligibility for catch-up limits was not limited to constrained IRA savers. In Section V, I explore potential explanations for the IRA participation response and the small decline in 401(k) participation rates.

C. Intensive Margin

In the years leading up to the EGTRRA, 70 percent of positive IRA contributors were constrained by the annual contribution limit, while only 9 percent of 401(k) contributors were constrained (Figure 1). Panel A of Table 3 reports estimates of equation (1) on: the sub-samples of positive IRA contributors (column 1), positive 401(k) contributors (column 2), those with a positive IRA or 401(k) contribution (column 3), and positive IRA and 401(k) contributors (column 4). I estimate that eligibility for catch-up limits

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26 The control means reported in Table 2 are from regressions of equation (1) without covariates or year fixed effects. In contrast, the estimates for $\beta$ are from regressions with covariates and year fixed effects.

27 Online Appendix Figure A3 visually displays the result for 401(k) ownership rates and Online Appendix Figure A6 displays this result for IRA or 401(k) ownership rates.

28 The control means reported in Table 3 are from regressions of equation (1) without covariates or year fixed effects. In contrast, the estimates for $\beta$ are from regressions with covariates and year fixed effects.
Figure 3

(a) IRA Participation Rates: Pre-EGTRRA

(b) IRA Participation Rates: Post-EGTRRA

Notes: The sample is all individuals between the ages of 40 and 59 that respond to either the IRA or 401(k) ownership questions in the relevant years. Contributions for those that do not respond to one of the two ownership questions are coded as zero.
increases deductible IRA contributions by a statistically insignificant $95 (standard error of $73) for positive contributors. Similarly, eligibility for catch-up limits increases deductible 401(k) contributions among positive contributors by $123; however, this estimate is also not statistically significant (standard error $141).

Taken at face value, the estimates in panel A suggest that the large expansion in IRA and 401(k) contribution limits did not have a significant impact on the contributions of positive savers. However, the estimates in panel A may be biased because of the participation response to catch-up limits, especially for IRAs. The positive participation response implies that positive IRA or 401(k) contributors just over and under the age of 50 may not be comparable, even if the two groups are comparable in the overall popula-
tion. For example, if those induced to begin making IRA contributions (participating) have lower tastes for saving, on average, than those that would have contributed in the absence of catch-up limits, then conditioning on any positive level of saving would lead to estimates that are biased downwards.

I address this concern by estimating lower and upper bounds on the effect of eligibility for catch-up limits for positive savers using the procedure developed by Lee (2009). Intuitively, this procedure ranks all contributors and calculates an upper (lower) bound on the effect of catch-up limits by assuming that all new contributors are the lowest (highest) savers among all positive contributors. Using this procedure, the upper bounds for the intensive margin effect of eligibility for catch-up limits for IRA and 401(k) contributions are $493 and $1,105, respectively. The latter estimate is near the top end of the range of the estimates for constrained 401(k) savers found by Routledge et al. (2014). In reality, it is likely that not all new savers have the lowest (highest) taste for saving. In this case, the true intensive margin effect of eligibility for catch-up limits lies between the estimates in panel A and panel B.  

V. HETEROGENEITY AND DISCUSSION OF POSSIBLE MECHANISMS

A. Heterogeneity in the Savings Response to Catch-up Limits

The estimates in Table 1 suggest that eligibility for catch-up limits did not significantly increase overall tax-deferred retirement contributions. However, the provision did lead to large increases in unconditional IRA contributions and participation rates. This suggests that the small overall effects of catch-up limits may mask heterogeneous responses across different groups of savers. To examine this possibility, I explore how eligibility for catch-up limits affects individuals with and without access to an employer-sponsored 401(k) plan. By definition, contributions to IRAs represent the only tax-deferred saving for the latter group. Note that the validity of the RDD in this case does not depend on whether savers whose employer offers a 401(k) plan are comparable to those whose employer does not. Rather, the identification assumption is that among individuals with access to a 401(k) (or who do not have access to a 401(k)), those just above 50 are comparable to those just below age 50.

---

29 Assuming that the intensive margin effect for IRAs is $250 — the midpoint of the range of the $100 estimate in panel A, Table 3 and the upper bound of $490 in panel B, Table 3 — the fraction of the total increase in IRA contributions coming from existing limit contributors is 250(0.067)/28 = 60 percent.

30 Another possibility is that 401(k) limits were not binding because only 9 percent of contributors saved close to the statutory limit prior to EGTRRA. As a result, the RDD may not be well-suited to pick up increases in saving from those at the extreme right tail of the 401(k) distribution. Moreover, since 401(k) contributions are, on average, much larger than IRA contributions, increases in the latter may be too small to pick up when looking at overall saving.

31 Online Appendix Table A11 confirms that the fraction of individuals with access to a 401(k) plan does not vary discontinuously at age 50, supporting the validity of the RDD. I also explore whether the effect of eligibility for catch-up limits varies between those with access to any pension plan versus those without access to any plan. The results are similar to the results reported in Table 4.
The SIPP respondents are only asked about whether their employer offers a tax-deferred 401(k) plan, as well as whether they are eligible to participate, in wave 7. This means that I only have information on the availability of a 401(k) plan for the 2002 and 2005 post-EGTRRA years. In contrast, the results throughout this paper are for the 2002, 2004, and 2005 years. Columns 1 and 2 of Table 4 confirm that the baseline results for total tax-deferred contributions and participation rates are similar for the subset of years for which 401(k) plan availability is observed. Column 1 of panel A replicates the result from column 3, panel C of Table 1 for total tax-deferred contributions. Column

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>2002 and 2005 Years Only</td>
<td>No 401(k) Available</td>
<td>401(k) Available</td>
</tr>
<tr>
<td>A. Total Tax-Deferred (IRA+ 401(k)) Contributions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>over50</td>
<td>–16.57</td>
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<td>39.99</td>
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</tr>
<tr>
<td></td>
<td>[34.93]</td>
<td>[47.61]</td>
<td>[19.14]**</td>
<td>[76.72]</td>
</tr>
<tr>
<td>B. Participation Rates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>over50</td>
<td>–0.005</td>
<td>–0.006</td>
<td>0.015</td>
<td>–0.034</td>
</tr>
<tr>
<td></td>
<td>[0.007]</td>
<td>[0.009]</td>
<td>[0.009]*</td>
<td>[0.014]**</td>
</tr>
<tr>
<td>Control mean: Contributions</td>
<td>1,007.50</td>
<td>904.12</td>
<td>78.17</td>
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</tr>
<tr>
<td>Control mean: Participation rates</td>
<td>0.234</td>
<td>0.215</td>
<td>0.049</td>
<td>0.418</td>
</tr>
<tr>
<td>Observations</td>
<td>54,748</td>
<td>30,188</td>
<td>17,471</td>
<td>12,717</td>
</tr>
<tr>
<td>Percent of population</td>
<td>100</td>
<td>100</td>
<td>57.8</td>
<td>42.4</td>
</tr>
</tbody>
</table>

Notes: All dollar amounts are inflated to 2010 dollars using the Bureau of Labor Statistics CPI Inflation Calculator. The sample in column 1 is individuals between the ages of 40 and 59 in the 2001 and 2004 SIPP panels that responded to either the IRA or 401(k) ownership questions (spanning the 2002, 2004, and 2005 calendar years). The sample in column 2 is restricted to the 2002 and 2005 calendar years only. The sample in column 3 (4) is further restricted to those that do not have a 401(k) plan available (do have a 401(k) plan available). In panel A, the dependent variable is a respondent’s reported total deductible tax-deferred account (IRA + 401(k)). In panel B, the dependent variable is a dummy variable equal to 1 if the respondent reports making a tax-deferred account (IRA or 401(k)) contribution and zero otherwise. The independent variable of interest, over50, is a dummy variable equal to one if a respondent will be 50 or older by the end of the calendar year, zero otherwise. All specifications are from a regression of outcomes on the over50 dummy, a polynomial of degree 1 that is allowed to vary on either side of the cutoff and the following covariates: white, black, Hispanic, female, married, personal earned income, number of kids under the age of 18, and three education attainment dummies. Each observation is weighted by its inverse sampling probability in the SIPP. Standard errors (brackets) are clustered at the birth cohort (year) level. *** p<0.01, ** p<0.05, * p<0.1.
2 reports the results from estimating equation (1) for the 2002 and 2005 years only. In both cases, eligibility for catch-up limits has a small, statistically insignificant effect on average overall tax-deferred contributions. The same is true for participation rates in panel B.

In the post-EGTRRA years, 58 percent of individuals do not have access to a 401(k) plan. Of this group, only 4.9 percent of those just under age 50 make a tax-deferred contribution (to an IRA) and the unconditional average contribution is $78.\textsuperscript{32} Eligibility for catch-up limits increases tax-deferred contributions by a statistically significant $40 or 51 percent (panel A, column 3). Moreover, the likelihood of making a tax-deferred contribution increases by 1.5 percentage points or 31 percent (panel B, column 3). Of individuals who do have access to a 401(k) plan, 42 percent of those just under age 50 make a tax-deferred contribution (to an IRA, 401(k), or both). The average contribution among those just under 50 in this group is $1,916. Eligibility for catch-up limits decreases retirement contributions by a statistically insignificant $83 (standard error $77) or 4 percent. The likelihood of making a tax-deductible contribution among those in this group decreases by 3.4 percentage points or 8 percent.\textsuperscript{33}

The estimates in Table 4 indicate that eligibility for catch-up limits led to a large and statistically significant increase in the tax-deferred contributions and participation rates of those without access to an employer-sponsored 401(k). This contrasts with the small, statistically insignificant effect on retirement saving for those with access to a 401(k). In order to better understand this result, it is important to note that there are significant differences between the two groups. Individuals with access to a 401(k) plan are, on average, more likely to have a job, are nearly three times more likely to work for an employer with more than 50 workers (a “large employer”), earn more, and are more educated than individuals without access to a 401(k) plan (Online Appendix Table A12).\textsuperscript{34} These differences may help explain why these two groups respond so differently to the introduction of catch-up limits.

Tables 5 and 6 further explore which individuals are affected by catch-up limits by estimating equation (1) on the sub-samples of high and low net worth individuals, both with and without access to a 401(k) plan.\textsuperscript{35} I define high net worth individuals as

\textsuperscript{32} The control means reported in Table 4 are from regressions of equation (1) without covariates or year fixed effects. The average contribution by those with a positive contribution is $78/0.049 = $1,592.

\textsuperscript{33} I explored potential explanations for the decline in the likelihood of making a tax-deductible contribution among those with access to a 401(k) plan. One possible explanation is that confusion about how the introduction of catch-up limits affected the taxation of employer pension plans discouraged take-up by some individuals over the age of 50. The IRS did not clarify the final rules for catch-up limits until August 2003; in particular, catch-up contributions are not subject to nondiscrimination tests. As a result, many firms did not offer catch-up limits in their 401(k) plan until 2004 (Kaplan, 2002; Holden and VanDerhei, 2005). In the post-EGTRRA years, 62 percent of individuals with access to a 401(k) plan actually owned a 401(k), consistent with prior research that finds that the take-up of these plans is not universal.

\textsuperscript{34} Online Appendix Table A12 also shows that those with access to a 401(k) plan are more likely to be white, married, and veterans, and are less likely to be black, Hispanic, and female.

\textsuperscript{35} The control means reported in Tables 5 and 6 are from regressions of equation (1) without covariates or year fixed effects. In contrast, the estimates for $\beta$ are from regressions with covariates and year fixed effects.
those whose predicted net worth is above the median for individuals of the same age. Eligibility for catch-up limits increases total tax-deferred contributions among both high and low net worth individuals without access to a 401(k) plan. However, the increase in average contributions is larger in percentage terms for low net worth individuals. In particular, the tax-deferred contributions of this group increase by $43 compared to a control mean of $35 and participation rates increase by 1.8 percentage points compared to a control mean of 2.5 percent. The coefficient estimates for high net worth individuals are of similar absolute magnitude but are not statistically significant.
B. Discussion of Possible Mechanisms

Eligibility for catch-up limits increases IRA and total tax-deferred contributions by 51 percent among those without access to a 401(k) plan. Moreover, the higher average IRA contributions are driven, at least in part, by an increase in the likelihood of making a deductible contribution, contrary to the predictions of the neoclassical-life cycle model. In this subsection, I discuss some possible mechanisms that may be driving this response.

Anecdotal evidence suggests that financial institutions may have increased their IRA product advertising following the introduction of catch-up limits. This advertising appears to have been targeted towards those over the age of 50 as part of a strategy to increase assets under management (Dalton, 2001). Such targeted advertising may have

| Table 6 |
The Effect of Eligibility for Catch-up Limits on Retirement Account Participation Rates by Availability of a 401(k) Plan and Wealth

<table>
<thead>
<tr>
<th>(1) All</th>
<th>(2) High Wealth</th>
<th>(3) Low Wealth</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. No 401(k) Available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>over50</td>
<td>0.015</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>[0.009]*</td>
<td>[0.016]</td>
</tr>
<tr>
<td>Control mean</td>
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<td>0.083</td>
</tr>
<tr>
<td>Observations</td>
<td>17,471</td>
<td>7,250</td>
</tr>
<tr>
<td>B. 401(k) Available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>over50</td>
<td>−0.034</td>
<td>−0.001</td>
</tr>
<tr>
<td></td>
<td>[0.014]**</td>
<td>[0.024]</td>
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<tr>
<td>Control mean</td>
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<td>0.433</td>
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<td>Observations</td>
<td>12,717</td>
<td>7,760</td>
</tr>
</tbody>
</table>

Notes: The sample in panel A is restricted to individuals that do not have a 401(k) plan available. The sample in panel B is restricted to those that do have a 401(k) plan available. The dependent variable is a dummy variable equal to 1 if an individual makes a tax-deductible contribution (IRA or 401(k)) and zero otherwise. Columns 2 and 3 further restrict the sample to high- and low-wealth individuals, respectively. High (low) wealth individuals are those whose predicted net-worth is above (below) the median for their age. The independent variable of interest, over50, is a dummy variable equal to one if a respondent will be 50 or older by the end of the calendar year, zero otherwise. All specifications are from a regression of outcomes on the over50 dummy, a polynomial of degree 1 that is allowed to vary on either side of the cutoff and the following covariates: white, black, Hispanic, female, married, personal earned income, number of kids under the age of 18, and three education attainment dummies. Each observation is weighted by its inverse sampling probability in the SIPP. Standard errors (brackets) are clustered at the birth cohort (year) level. *** p<0.01, ** p<0.05, * p<0.1.
raised awareness about catch-up limit rules, leading to higher participation rates for those over 50. For example, a 2004 article in the *American Banker’s Association ABA Trust & Investments* magazine encourages member institutions to actively promote catch-up contributions to their clients (Ellens, 2004). Another magazine for credit union executives specifically recommends mailing information about catch-up limit rules to IRA customers over the age of 50: “For example, send a direct mail piece explaining the new ‘catch-up’ contributions to your IRA owners who are age 50 or older...Not only will you educate your members about the IRA changes, you will create member awareness of the products and services your credit union offers” (Zuehlke, 2001).

The idea that the catch-up limit response may, at least in part, be due to advertising by financial institutions is consistent with the important role of promotional activities for explaining aggregate IRA contributions alluded to in Poterba, Venti, and Wise (1995), Bernheim (2002), and Saez (2009). It is also consistent with recent research that finds large advertising effects on the demand for checking accounts, mortgages, and credit cards (Gurun, Matvos, and Seru, 2016; Hastings, Hortaçsu, and Syverson, 2013; Honka, Hortaçsu, and Vitorino, 2015). The estimates in Tables 4, 5, and 6 show that the contribution and participation rate response to eligibility for catch-up limits is large for IRA owners that do not have access to a 401(k) plan. These individuals may not have access to timely information about retirement savings options from other sources, such as their employer. It is plausible that financial institutions looking to increase assets under management would direct advertising towards these savers. However, anecdotal evidence from industry magazines is not a perfect substitute for direct evidence that advertising is driving the participation response.36

Among those with access to a 401(k) plan, IRA contributions and participation rates may have increased because high savers were temporarily unable to contribute more to their 401(k).37 This is because the final rules about the tax treatment of catch-up limits for 401(k) plans was not issued by the IRS until the middle of 2003. Also, adopting catch-up limits required employer sponsors to amend their plan contracts, which may have temporarily limited the ability of some workers to make higher contributions (Kaplan, 2002). Online Appendix Table A13 reports coefficient estimates from regression specifications that allow for the effect of eligibility for catch-up limits to differ for those that are likely constrained by the 401(k) contribution limit. Specifically, I proxy for limit contributor status with a dummy variable equal to one for those who report

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36 In Online Appendix C, I explore another potential explanation for the IRA participation response to catch-up limits: the presence of fixed costs of making a deductible IRA contribution. The presence of fixed costs may only make individual participation optimal for relatively high contribution limits. If the presence of fixed costs are the primary explanation for the participation response to catch-up limits, then the average contribution of those induced to participate must be above the pre-EGTRRA limit of $2,000. I show that the average contribution by those induced to participate because of the introduction of catch-up limits is not identified, but that lower and upper bounds can be calculated given an estimate of the intensive margin response (i.e., the estimates in Table 3). However, I conclude that the fixed cost explanation is unlikely, unless the intensive margin response to catch-up limits is small in magnitude.

37 I thank David Richardson for suggesting this.
a 401(k) contribution within 10 percent of the pre-EGTRRA limit (i.e., $9,000), and equal to zero otherwise. While this variable is endogenous to tax-deferred contributions, if individuals over the age of 50 are more likely to be limit contributors, the bias is downwards.

With this caveat in mind, the evidence in Online Appendix Table A13 is inconclusive. The point estimates suggest that IRA contributions fell for 401(k) limit contributors over the age of 50 between 2002 and 2005, while 401(k) contributions increased over the same period. In particular, the differential effect of eligibility for catch-up limits on the IRA contributions of 401(k) limit savers is $185 in 2002 and $2 in 2005. The differential effect of eligibility for catch-up limits on the 401(k) contributions of 401(k) limit savers is $85 in 2002 and $281 in 2005. This is consistent with high savers temporarily substituting between IRAs and 401(k)s as firms eventually adopt catch-up limits. However, the standard errors for these estimates are large. As a result, I cannot reject the null hypothesis that the average 2002 and 2005 IRA or 401(k) contributions for this group are statistically significantly different from each other.

VI. CONCLUSION

Using an empirical strategy that aims to address the limitations of prior research, this paper asks whether the introduction of catch-up limits increases contributions to retirement savings plans. This topic is particularly relevant given the recent debates about the adequacy of retirement saving. I argue that using eligibility for catch-up limits, an IRA and 401(k) contribution rule allowing individuals over the age of 50 to contribute more than those under 50, permits clearer identification of the savings effect of raising limits than previous empirical strategies.

The main result is that while eligibility for catch-up limits does not have a statistically significant effect on overall retirement contributions, this masks significant heterogeneity both across individuals and types of retirement savings accounts. In particular, eligibility for catch-up limits leads to a large and statistically significant increase in tax-deferred contributions by individuals without access to a 401(k) plan. Figure 4 displays the implied average total tax-deferred contribution for positive contributors using the estimates from Table 4. Among positive contributors just under 50 without access to a 401(k) plan, the average tax deferred contribution is $78/0.049 ≈ $1,592. For those without access to a 401(k) plan, the likelihood of making an IRA contribution increases by 1.5 percentage points (31 percent) at age 50. This increase implies an average tax-deferred contribution of $(40+$78)/0.049 ≈ $2,408, a more than $800 increase compared to those just under 50. In contrast to the overall effects for IRAs, I find small and insignificant effects of eligibility for catch-up limits on the total contributions of those that do have access to a 401(k).

In the neoclassical life-cycle model we do not expect that a change in the contribution limit will affect the choices of agents for whom the constraint is not binding. The finding that eligibility for catch-up limits leads to large increases in IRA participation rates, however, suggests that the initial response to the provision was not limited to constrained
I discuss possible mechanisms that may be driving this result. For example, anecdotal evidence suggests that financial institutions directed advertising specifically towards IRA owners over the age of 50. This advertising may have increased awareness about the IRA limit increases, leading to higher contributions and participation rates. The results have important policy implications for our understanding of the effect of raising contribution limits on retirement savings. One is that policy makers should consider the responses by other economic agents, such as financial advisors, banks, credit unions, and mutual fund companies, when designing retirement savings programs. These agents can complement the intended design of policies. Also, throughout the sample period the statutory contribution limit for IRAs was far below the limit for 401(k) plans. While the two plans are similar, there are some important differences. For example, most 401(k) contributions are made through regular payroll deductions, whereas savers have much more flexibility about the amount and timing of their IRA contributions. Some individuals that prefer saving in IRAs may opt for a 401(k) plan.

Notes: This figure reports the implied average total tax-deferred (IRA plus 401(k)) contribution (and associated 95 percent confidence intervals) for SIPP respondents with and without access to an employer-sponsored 401(k) plan. Average contributions for treated (control) individuals correspond to those just above (below) the age 50 cutoff for catch-up limits. The implied average contributions are calculated using the contributions and participation rates for individuals for those just below age 50. For example, consider individuals without access to a 401(k) plan. 4.9 percent of these individuals just under age 50 contribute to either an IRA or 401(k) and the average unconditional contribution is $78. The implied average total tax-deferred contribution for those just below age 50 (control group) is $78/0.049 = $1,592. The implied average total tax-deferred contribution for those just above age 50 (treated group) is ($40+$78)/0.049 = $2,408.
because of the relatively low deductible limit for their preferred account. As a result, a reform that reduces the difference between the contribution limits of the two accounts may be welfare improving (without necessarily generating new saving) if it allows individuals to save in their preferred account.

While informative about how expanding IRAs and 401(k)s affects contributions to these plans, the results in this paper do suffer from some limitations. First, the age-related RDD identifies the effect of eligibility for catch-up limits on savings at age 50. While studying the behavior of individuals at this prime savings age is of great interest to policy makers and economists, the results in this paper may not generalize to those in other age groups. Second, the observed jump in IRA participation rates is consistent with several explanations, each of which may be partially responsible for driving the results. Further exploring these possible explanations, such as the potential for advertising by financial institutions to affect retirement savings decisions, may be a fruitful area of future research. Finally, the analysis in this paper does not address how eligibility for catch-up limits affects overall saving (i.e., tax-deferred retirement saving plus saving in taxable accounts and home equity). Therefore, the question of whether the increase in retirement saving, especially for those that do not own a 401(k), leads to higher total saving requires further study.

ACKNOWLEDGMENTS

I am grateful to Kory Kroft, Philip Oreopoulos, and Michael Smart for their guidance throughout this project. Also, thanks to two anonymous referees, William Gentry (editor), Elliot Ash, Michael Baker, Nicolas Gendron-Carrier, Alexander Gelber, Michael Gilraine, Ashique Habib, Dominika Langenmayr, Erica Lavecchia, Robert McMillan, Derek Messacar, David Richardson, and seminar participants at the Empirical Microeconomics (CEPA) seminar at the University of Toronto, CEA 2014, EconCon 2014 CPEG 2014, and NTA 2014 for helpful comments and discussions. An earlier draft of this paper circulated under the title “Does Raising Contribution Limits Lead to More Saving? Evidence from the ‘Catch-up Limit’ Reform.” I am grateful for support from the Social Sciences and Humanities Research Council (SSHRC) and the H. Stanley Hunnisett Fund. All remaining errors are my own.

DISCLOSURES

I have no financial arrangement that might give rise to conflicts of interest with respect to the research reported in this paper.

REFERENCES


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