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Ngoc Dao and Manita Rao

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Center for Retirement Initiatives (CRI)
McCourt School of Public Policy
Georgetown University
125 E Street NW
Washington, D.C, 20001
Email: criretirement@georgetown.edu
http://www.cri.georgetown.edu

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Abstract

Over a quarter of US adults are expected to retire in the coming decade, retirees with inadequate savings could face financial difficulties including having to rely on public welfare during retirement. Amid rapid aging of the US population, this paper examines the causal effect of the Catch-up Contribution provision introduced in 2001 on retirement assets and non-retirement savings. We investigate the expectation that incentives for policy response vary by household income and if the policy led to crowd out of non-retirement household savings. The paper uses data from the Survey of Consumer Finance (SCF) from 1995 to 2016. We estimate Average and Heterogenous Treatment effects of the policy on retirement preparedness using triple difference-in-differences models. We find that the Catch-up Contribution provision increased contributions among middle- and high-income households, although low- and moderate- income households also benefited from higher retirement assets. In addition, we find no evidence of crowd-out of non-retirement savings suggesting that the Catch-up Contribution provision was welfare enhancing.

Keywords: Retirement preparedness, Catch-up contributions, older adults, household wealth

JEL: H24, G51, D14, D31

Ngoc Dao
Assistant Professor, Department of Criminal Justice and Public Affairs, Kean University, and Research Fellow, Center for Financial Security, University of Wisconsin-Madison
1000 Morris Avenue, Union, New Jersey 07083
ndao@kean.edu

Manita Rao
Senior Strategic Policy Advisor, AARP Public Policy Institute, and Non-Resident Scholar, Georgetown University Center for Retirement Initiatives
601 E St., NW Washington, DC 20049
mrao@aarp.org

Introduction

Demographic transitions and a rapidly aging population have made retirement security a pressing concern for policy makers in the United States. Between 2010 and 2022, the share of adults 65+ in the US witnessed over 38% growth compared to 2% for younger cohorts.[1] 1 in 5 people in the United States will be age 65 or over by 2040 and the majority of the 80.8 million older adults are expected to exit the labor force and enter retirement. Retirees with limited retirement savings could need public assistance if savings are insufficient to meet income needs during retirement. While most retirees will receive income from Social Security, private savings are an increasingly important source of retirement income for financial wellbeing in retirement. In this paper we investigate the effectiveness of the Catch-up Contribution policy introduced in 2001 as a means to incentivize private retirement savings on household savings and retirement preparedness among near retirees.

The federal government plays a key role in inducing workers to save for retirement. Federal tax expenditures that incentivize retirement savings are the second largest category of tax expenditure at the federal level. In 2022, the federal government provided close to $300 billion as incentives to retirement savers through tax deferrals on qualified retirement savings accounts (Joint Committee on Taxation, 2022). This includes $193.4 billion in federal tax expenditures for Defined Contribution (DC) plans, with 401(k)-type plans making up the largest share, and $77.4 billion for Defined Benefit (DB) plans. Tax expenditures for retirement are expected to grow by 45% to 551.6 billion by 2026.

[1] Administration on Aging, US Department of Health and Human Services; Accessed at https://acl.gov/sites/default/files/Profile%20of%20OA/2021%20Profile%20of%20OA/2021ProfileOlderAmericans_508.pdf

Despite these federal incentives, over half of workers aged 55 to 64 do not have access to retirement savings vehicles such as a workplace 401(k) type plan. Even fewer older adults have Individual Retirement Account (IRAs) and DB pensions. Among those that do have access to workplace retirement savings plans, the median account balance of workers approaching retirement is just $15,000 indicating that older Americans are financially underprepared for retirement (Ghilarducci, Bernard and Schwartz, 2016).

In this paper, we study the effect of the Catch-up Contribution provision, introduced under the 2001 Economic Growth and Tax Relief Reconciliation Act (EGTRRA), on retirement preparedness. The Catch-up Contribution policy increased statutory limits on contributions to Tax-Deferred Retirement Accounts (TDRAs) such as workplace 401(k) plans and IRAs for adults 50 and older. Exploiting the increase in statutory limits under this policy, which provides a natural experiment to examine the relationship between tax incentives and retirement savings, we evaluate how individuals that became eligible to make a catch-up contribution (ages 50 and above) differed in retirement contributions and retirement assets from individuals that were ineligible to make a catch-up contribution (50 and below). In addition, we assess the extent to which policy-induced retirement savings, if any, crowd-out non-retirement household savings or whether they constitute "net-new" retirement savings.

Furthermore, we argue that incentives for households to increase savings in response to the policy will vary by income: middle- and high-income households have stronger incentives to increase contributions in response to the policy while low-income households may have weaker incentives for policy response. This hypothesis is motivated by differences in social security replacement rates and disposable income that can be directed towards "additional" savings, both these factors can be expected to vary across the household income distribution.

Theoretically, retirement savings, when annuitized, complement income from Social Security over the course of retirement. Because low-income households have higher Social Security replacement rates (defined as the share of pre-retirement income replaced by post-retirement income from Social Security) compared to middle- and high-income households, private retirement savings constitute a larger fraction of post-retirement income for the latter. This skews the incentive of the marginal household in the income distribution to change its retirement contribution in response to the new policy. In addition, to the extent that middle- and high-income households with disposable income choose to direct income towards "additional" savings, we investigate the marginal propensity to increase savings for retirement vis-à-vis non-retirement savings.

We use data from the Survey of Consumer Finances (SCF) from 1995 to 2016 to estimate Average Treatment Effects (ATE) of the adoption of the Catch-up Contribution policy on retirement contributions, total retirement assets, and non-retirement household savings. We also examine heterogenous treatment effects to assess differential policy responses across the household income distribution by stratifying the sample into income quartiles. Employing a potential outcomes framework, we estimate differences-in-differences (DiD) and triple-difference (triple DiD) models and evaluate the effect of the policy on several types of financial outcomes - TDRA contributions (defined as workplace 401(k) type plans), assets in workplace and non-workplace retirement accounts as well as non-retirement household savings accounts.

We estimate that, overall, the policy led to an average increase of $1,485 (18 percent) in TDRA contributions. The effect size indicates that a 50-year-old adult that makes a Catch-up Contribution at age 50 will have an additional $7,000 in retirement savings when she turns 64 years old (see Figure 4). However, we observe declines in TDRA contributions by an average of

$1,595 (31 percent) for households in the second quartile and by $991 (26 percent) for households in the third quartile of the income distribution, respectively. We also find that the Catch-up Contribution policy had substantial long run effects and the observed increase in contributions persist for several post-policy years.

This study contributes to two lines of literature on household finance and retirement savings. First, it develops and extends literature on effectiveness of tax benefit policies to incentivize household savings retirement savings. More specifically, it sheds light on a central debate in the literature: the extent to which tax policies are an effective policy tool to bolster savings and improve retirement preparedness. Second, it contributes to literature on how policies that alter statutory limits influence household savings behavior. Using a rich dataset on household financial characteristics – the Survey of Consumer Finances[2] - and estimating heterogenous effects of how policy response varies across the household income distribution, we find that tax benefit policies are effective policy tools to incentivize saving for all households. However, policies that alter statutory limits to incentivize 'additional' savings are more likely to aid savings among middle- and high-income households relative to lower income households because of skew in incentive structures and disposable income needed to save more for retirement.

The paper proceeds as follows: section 2 reviews current literature on tax incentives and behavioral response to retirement savings policies. Sections 3 and 4 describe the data and empirical method. Sections 5 and 6 presents results on TDRA contributions, retirement assets and the crowd-out effect on other forms of savings. Section 7 concludes.

[2] Such as Rutledge et. al. (2016) and Lavecchia (2018) which use the Survey of Income and Program Participation (SIPP) which oversamples low-income households.

Policy Background and Literature Review

The Economic Growth and Tax Relief Reconciliation Act of 2001(EGTRRA) introduced two incentives to increase retirement savings. First, starting in 2002, contribution limits for tax-qualified accounts such as 401(k)s and IRAs increased by $1,000 per year and gradually rose to $15,000 in 2006. After 2006 the limit was indexed to inflation. Second, to further encourage retirement savings among older workers, EGTRRA permitted additional contributions known as "Catch-up" Contributions for participants over the age of 50. The Catch-up Contribution provision became effective in 2002, the limit on Catch-up Contributions was $1,000 in 2002 and increased by $1,000 per year until it reached $5,000 in 2006. In 2020, the deferral limit for 401(k) plans was $19,500, but older adults (50 +) could contribute an additional $6,500 per year[3] under the Catch-up Contribution provision.[4] The idea behind the Catch-up Contribution provision is that individuals, who may postpone saving for retirement when they are younger, may need to shore up savings as they approach retirement (Quan et. al. 2015).[5]

Despite the importance of the Catch-up Contribution policy to incentivize retirement savings among near-retirees, its impact on retirement savings has received little attention. In addition, there is limited work on how statutory changes to TDRA limits affect savings behavior. In theory, because the Catch-up Contribution policy increases contribution limits, the policy can be expected to have maximum effect on households that contribute at the pre-policy limit and have higher savings preferences because these households are now able to increase contributions up to

[3] Contribution limits that apply to other tax-deferred retirement saving such as 403(b) and 457 plans are similar. More details see Appendix B.

[4] The Secure 2.0 act passed in 2022 further increased catch-up contribution limits for individuals 50+ to $7,500 and to $10,000 for individuals 60 to 63, these higher contribution limits come into effect in 2025. The legislation also introduced a new requirement under which individuals earning over $145,000 can only make catch-up contributions on a post-tax basis to Roth Accounts while individuals' earnings $145,000 or lesser, adjusted for inflation going forward, would continue to make catch-up contributions as pre-tax dollars to 401(k) and IRA accounts. These policy changes do not affect the results in this paper.

[5] The Catch-up Contribution provision is unique to the US, we are not aware of any other countries that provide similar tax incentives for Catch-up Contributions targeted specifically of adults age 50+.

the new higher limit. However, we argue that a household's pre-policy savings behavior is a non-binding constraint on savings response. In other words, households below the pre-policy limit nearing retirement could also be incentivized to increase savings to capture additional tax benefits provided under to the new policy. Therefore, an analysis restricted to households contributing at the pre-policy limit could underestimate the total policy effect by failing to capture policy response of 50+ households below the pre-policy limit.

Previous research provides mixed findings on the effectiveness of the Catch-up Contribution policy for retirement savings. For instance, Holden et. al. (2005) finds that the policy is associated with higher IRA contributions among a third of 50+ households at the pre-policy maximum; while Kawachi, Smith and Toder (2005), find contributions declined from 7.5 percent to 6 percent. More recent studies are similarly inconclusive as well. Rutledge et. al. (2016) uses longitudinal Social Security Administration data combined with the Survey of Income and Program Participation (SIPP) and finds a 0.2 percentage-point increase in 401(k) contributions (or roughly $818) among 50+ households while Lavecchia (2018), using the same data source, finds no statistically significant increase in 401(k) contributions. Goodman (2020) which tests for contribution and crowd-out responses using administrative data from tax records finds that higher contributions to TDRA and non-TDRA accounts do not crowd-out non-retirement savings.

However, there are two concerns with these studies: First, they focus exclusively on households at the pre-policy maximum, a subset of the 50+ population that are eligible for the higher contribution limit; Second, studies that use the SIPP which has an oversample of low-income households may be less likely to estimate the true policy effect. Because of these constraints, findings in previous studies could underestimate the effect of the Catch-up Contribution policy on retirement savings.

Contrary to earlier studies, in this paper, we test the proposition that the effect of the Catch-up Contribution policy can be expected to be more widespread and not limited to households at the pre-policy maximum in addition to using a dataset that provides richer financial data on middle- and upper-income households. More specifically, we hypothesize that the Catch-up Contribution policy could impact savings decisions of all 50+ individuals and pre-policy household savings behavior is not a constraint on post-policy contributions. We propose that a variety of reasons could drive the savings behavior of 50+ households to be encouraged to respond to the policy due to proximity to retirement, or the desire to capture "additional" tax benefits that become available at age 50. Hence, we test how the Catch-up Contribution policy influenced savings behavior of 50+ households across the income spectrum.

A related and ongoing policy debate on understanding the link between tax incentives and retirement savings across the income distribution relates to whether tax incentives for retirement boost overall net wealth or induce households to substitute between retirement and non-retirement savings. Early studies indicate that tax incentives create new savings with an average increase of 30 percent net increase in savings although this effect is concentrated among middle- and high-income households (Venti and Wise, 1991; Poterba, Venti and Wise, 1996; Hoynes and McFadden, 1994). Among lower-income households, tax incentives for retirement are associated with a substitutional effect, households at the lower end of the income distribution are more likely substitute saving in non-retirement accounts with retirement savings (Engen, Gale and Scholz, 1996). These early studies, however, fail to account for endogeneity in savings behavior which could influence household responses to tax incentives.

Findings from more recent studies that take into account these endogeneity concerns indicate that tax incentives for retirement savings are associated with new savings among some

households in the income distribution while substitution effects are more pervasive in among other households. For instance, findings from Benjamin (2003) and Chernozhukov and Hansen (2004) which uses 401(k) eligibility as an instrument for TDRA participation and an instrumental quantile regression approach shows that about half of all TDRA savings are new savings that lead to net gains in household wealth for households in the lower tail of the income distribution. On the other hand, Gelber (2011) uses exogenous changes in 401(k) tenure rules and finds that consistent with a crowd-in hypothesis, newly eligible workers significantly increase 401(k) and IRA contributions. Heim and Lurie (2012) find that policies that lower after-tax contribution costs are associated with increase in TDRA participation and contributions among lower income households.

Taken together, previous research on tax incentives for retirement savings and the Catch-up Contribution present largely mixed evidence on how these policies benefit different income groups are the extent to which they induce substitution between retirement and non-retirement savings. This paper advances the literature by examining by considering the effect of the Catch-up Contribution policy on retirement preparedness using richer data on household finances – the Survey of Consumer Finances - that cover a longer period and a sizeable sample of middle- and high-income households to test heterogenous policy effects across the income distribution.

Conceptual Framework and Predictions

We follow Milligan (2003) to predict the effect of statutory changes in contribution limits on retirement contributions using a partial equilibrium three-period life-cycle model. In this model, individuals' intertemporal decisions over three periods affect their retirement contributions: individuals work in both period 1 (until they reach 49 years old) and period 2 when they turn 50.

Workers earn, pay taxes, consume, and save for third period's consumption. In period 3, the individuals retire, earn no income, and consume all savings. In the first two periods, individuals undertake two types of savings: tax-deferred savings – R_t – are deductible from income for tax purposes but will be taxed upon withdrawal in period 3, while the other savings – S_t – are not. Furthermore, interest earned on R_t is not taxed as it accrues, in contrast, interest on S_t is taxed in each period. A contribution limit – L_t – constrains depositing into tax-deferred saving accounts in each period. And in the case of the Catch-up Contribution provision, individuals face a lower contribution limit in period 1 than in period 2 where they turn 50 years old or $L_1 < L_2$.

In Milligan's model, contribution limits applied to the tax-deferred saving accounts and the limits differ in each period, three cases would be predicted. First, if the limits are binding in both periods, and if there is a higher contribution cap in the second period it might increase savings in this period but cannot affect tax-deferred savings in the first period. Second, if the limits are not binding, taxpayers' behaviors might not be different than the no-limit case where they optimally allocate their savings to maximize their lifetime utility. And third, if the contribution limit binds in one period and does not in the other, taxpayers would shift contributions into periods where the constraint is not binding. In any scenario, tax incentives such as the Catch-up Contribution provision is expected to increase contributions among those who are constrained by the limit [6] if substitution effects dominate income (or wealth) effects (Duflo et al., 2006; Engelhardt and Kumar, 2007). Individuals respond to the limit increase by raising retirement contributions as a

[6] Addition to the potential impact of tax incentives Collins and Wyckoff, 1988; Poterba, Venti and Wise, 1995; Milligan, 2002) , other factors that might influence tax-deferred savings include age, gender, education, job tenure, income, and planning horizon or taste for saving (Holden and VanDerhei 2001; Munnell, Sunden, and Taylor 2003; General Accounting Office 2001; Congressional Budget Office 2003). Plan features such as default contribution rate, employer matching rates, and loans provision are also key elements affect the contribution (Madrian and Shea 2001; Choi et al. 2004a; Choi et al.2004b, Papke and Poterba 1995, Choi et al. 2002; Englehardt and Kumar 2003, Holden and VanDerhei 2001).

result of the combination of increasing labor supply, reducing consumption, and decreasing taxable (or non-retirement) savings. However, if income effects dominate substitution effects, then increase in contribution limits to TDRAs would reduce contributions to retirement accounts and increase current consumption. Therefore, the net effect of the Catch-up Contribution provision on household savings behaviors is an empirical question because of its theoretical ambiguity.

For those who are not constrained by the contribution limit (i.e., they have never contributed close to the cap), some of the possible reasons for the increase in contributions among these individuals could be rise in real incomes, intertemporal contribution shifts into periods where the constraint is non-binding or positive spillovers from education, financial advice, employer's matching rate, and peer information, which could be important determinants of contribution decisions.

Data and Methods

We use data from the Survey for Consumer Finances (SCF) from 1995 to 2016 to analyze individual and household behavioral responses to the introduction of the Catch-up Contribution provision introduced under the 2001 EGTRRA. The SCF is a triennial cross-sectional survey of U.S. families conducted by the Federal Reserve Board of Governors. It provides detailed information on household balance sheets, pensions, income, and demographic characteristics.[7] Although the SCF is not conducted annually, it is appropriate for the purpose of this study because of its unique information on household savings of all types of financial assets including

[7] The design of the SCF survey questions is almost identical across years except for some small change since 2010, questions on retirement plans have been asked for only 2 primary plans instead of up to 3 plans as previously. Several personal demographic questions such as education were renamed (but the content is the same). These changes do not affect the core definition of the variables in the survey or our estimates.

contributions to retirement plans, retirement assets, non-retirement savings, mortgage, and household debt which allow for constructing our three main variables of interest: contributions to TDRAs, retirement assets, and taxable (non-retirement) savings. The SCF also oversamples middle- and high-income households because these households account for a disproportionately large share of overall household wealth in the United States. To overcome bias from this oversample, we use sampling weights to compute the distribution of survey variables in the population. Unless otherwise noted, all the analyzes in this paper utilize population weights.

We restrict our sample to currently working individuals with at least one year of job tenure at their main job, which would make them eligible to participate and contribute to a TDRA (Pence, 2002).[8] In addition, the estimated models account for potential labor market shifts and macroeconomic conditions like the financial recession in 2008 which could affect earnings and savings capacity by controlling for unemployment rates. We find that both groups (those above and below 50) demonstrate similar patterns of employment in the pre-policy period (see Figure 1 - Appendix D).

We define tax-deferred savings plans as 401(k)/403(b)/457(b) plans, Thrift Savings, Profit Sharing, and Stock purchase/ESOPs[9] to ensure consistency across survey years. The SCF provides information on contributions to TDRAs and financial assets.[10] Therefore, we estimate effect of the policy on three variables - TDRA contributions, assets in retirement accounts and assets in non-retirement accounts (detailed descriptions of all outcome variables are provided in Appendix A).

[8] The sample excludes individuals who report not working or disabled, both groups may be less able to save due to diminished earning capacity. The sample also excludes self-employed individuals because the SCF does not report contributions of this group to TDRAs.

[9] There are small variations in Catch-up Provision rules as they apply to different types of retirement plans such as 401(k), 403(b) and 547(b), but given the nature of the survey design of the SCFs, we assume that rules that apply to contribution limits are similar across all tax-deferred retirement plans. And this assumption does not affect our estimates.

[10] The Catch-up Contribution Provisions for IRAs was $500 in 2002, gradually raised to $1,000 in 2016, and up to date.

The data constraints in the SCF may limit generalizability of findings (Amronim et al., 2007) but our paper provides insights into household behavioral responses and how policy incentives can have differential impact across the income distribution. All dollar values are deflated to 2016 constant dollars using the CPI-U.

Measures of household wealth and retirement assets are complicated because they include both contributions to retirement accounts as well as asset returns that depend on the investment portfolio and market conditions. Because of the lack of a standardized ways to measure household wealth, wealth variables are subject to measurement error that could also result from outliers due to either extremely large gains or losses, or response errors.

For example (as shown in Table 1) the mean for household retirement assets is $76,360 but with a standard deviation of $243,102. To handle such extremely large outliers, we winsorize all continuous variables at the 99 and 95 percentiles (at the positive ends for variables with a zero upper bound and at both ends for variables with positive and negative values) (Gunn et al, 2017; Leone et al., 2019). In the results section we present estimates from models estimated using both the unwinsorized and winsorized (at 95th percentile) sample.[11] Our preferred model is winsorized at the 5th and 95th percentile because these results can speak to the majority of the population in each income quartile.

Table 1 presents summary statistics for individuals aged 25 – 64[12] currently working with at least one year of tenure. The average TDRA contribution was $2,414 for the full sample, contributions conditioned on having a TDRA were $5,259, and accumulated average TDRA balance was $47,286. However, TDRA contributions vary substantially when the sample is

[11] The estimation results for outcomes that are winsorized at 99th percentile will be presented upon request.

[12] We limit our sample to contain individuals from 25 years old and older as the starting point of prime age workers.

stratified by household income. Workers in the highest income group (>=75th percentile of the household income distribution), contributed an average of $6,862 to their TDRAs while the average TDRA contributions was $300 among households in the lowest income quartile. 23 percent of the sample is female, 70 percent are white, and over half are married. Two third have at least some college education, and 50 percent work for firms with more than 500 employees.

Empirical Strategy

We begin the analysis by estimating a standard Difference–in–Differences (DiD) model that compares outcomes for the treatment group (individuals aged 50 – 64 years old) to those in the control group (individuals aged 25 – 49 years old) between the pre-treatment period (1995 to 2001) and the post-treatment period (2002 to 2016).

For each outcome variable, we estimate the following classic DiD regression:

$$Y_{it} = \alpha + \beta(Age50_i * Catchup_t) + \sigma Age50_i + \eta Catchup_t + \gamma X_{it} + \lambda_t + \varepsilon_{it} \quad (1)$$

where Y_{it} is the outcome variables of interest – TDRA participation, TDRA contributions, total retirement assets, and non-retirement savings - for individual i at time *t*. $Age50_i$ is a binary variable equal to 1 if the individual is 50 years or older, and 0 otherwise, in year t. $Catchup_t$ is a binary variable equal to 1 if the time period is after the adoption of the Catch-up provision (year > 2001). X_{it} is the vector of covariates including age, gender, marital status, race, education, household size, indicator for having any children under 18 years old, occupation, firm size, an indicator representing whether the household had a defined benefit (DB) pension, spouse's educational attainment, an indicator for expecting to receive inheritance, and a categorical variable

for expectation about income in retirement, scaling from 1 (totally inadequate) to 5 (very satisfactory). Standard errors are clustered by age cohort.

The focus of this paper is examining the effect of the Catch-up Contribution provision on contributions to TDRAs and retirement wealth. Since all 50+ households qualify under the new policy, we include households at and below the pre-policy limit to assess savings responses. In addition, we stratify households into 4 quartiles based on household income: (>=75th, 50th - 75th, 25th - 50th, and < 25th) to test the hypothesis that savings responses will vary by income group.

Figure 1a and 1b present pre-policy trends for the treated and control groups across different income groups. As expected, households at the 75th quartile have a higher share of households contributing at the pre-policy limit. Therefore, while we expect policy effect will be highest for this group, we test the hypothesis that 50+ households from other income groups including those below the pre-policy limit may be incentivized to increase contributions as they near retirement and have a desire to benefit from the additional tax benefits provided under the policy.

For each income quartile, we estimate the following triple DiD model that interacts policy year, age, and income quartiles.[13]

$$Y_{igt} = \alpha + \delta Age50_i + \eta Catchup_t + \nu IncomeGroup_g + \beta_{12} Age50_i Catchup_t + \beta_{13} Age50_i IncomeGroup_g + \beta_{23} Catchup_t IncomeGroup_g + \beta_{123} Age50_i Catchup_t IncomeGroup_g + \gamma X_{it} + \lambda_t + \varepsilon_{igt} \quad (2)$$

[13] The Social Security Earnings Test Elimination was introduced in the early 2000s. This policy could confound our estimates because of its proximity in introduction with the Catchup-Contribution policy. However, previous research shows that the SS Earnings Test Elimination policy had minimal effect on labor supply (Duggan et. al. 2021) so we expect the impact on TDRA contributions to be minimal, if any. Other policies such as changes in the Full Retirement Age and the Social Security Delayed Credit under the 1983 Social Security Amendment Act, which is before our study period. Therefore, we don't anticipate these policies to confound our estimates. Since the early 1990s, the retirement sector has shifted from Defined Benefit to Defined Contribution plans. These shifts affected all participants in the DC system and were not limited to adults 50+, therefore we do not expect the transition from DB to DC to differentially affect older adults that are eligible under the Catch-up Contribution policy.

where $IncomeGroup_g$ is a binary variable equal to 1 for individuals in or above the 75th quartile, in the 50th - 75th, in the 25th - 50th, and in less than the 25th quartile of the household income distribution, respectively. The parameters of interest – ($\beta_{12} + \beta_{123}$) - estimate the effect of the Catch-up Contribution provision.[14] We conduct several robustness tests for the main outcomes and find the estimated effects are supported across all robustness models, details of these tests are provided in the Appendix B.

We further estimate event-study models to (1) test the parallel pre-trend assumptions required for DiD estimation and (2) explore dynamic treatment effects for multiple post-treatment years. The Catch-up Contribution provision was adopted to increase retirement savings among those approaching retirement. Additionally, contributions to tax-deferred retirement plans such as 401(k) plans accumulate assets over time and increase with age. This could potentially lead to biased estimates if pre-treatment contribution levels varied between individuals 50 and older and those younger than 50. We test for age-based pre-treatment assumptions using an event-study approach specified as follows:

$$Y_{igt} = \alpha + \delta Age50_i + \nu IncomeGroup_g + \sum_{j=-7}^{14} \beta_{12}^{j} Age50_i * 1(t_j - T^*) + \beta_{13} Age50_i IncomeGroup_g + \sum_{j=-7}^{14} \beta_{23}^{j} IncomeGroup_g * 1(t_j - T^*) + \sum_{j=-7}^{14} \beta_{123}^{j} Age50_i IncomeGroup_g * 1(t_j - T^*) + \gamma X_{it} + \lambda_t + \varepsilon_{igt} \quad (3)$$

where $\beta_{12}^{j} + \beta_{123}^{j}$ estimate the coefficient of interest - the interaction (β_{12}^{j}) between treated group with an indicator for the event-year given by $1(t_j - T^*)$ and the point estimate for the three-way interaction (β_{123}^{j}) between the treated group, income group indicator and the event-year

[14] When adding age dummies to better control the difference across age cohorts, the results are mostly identical. Results are presented upon requests.

indicator $1(t_j - T^*)$. The event year indicator ($1(t_j - T^*)$) equals 1 when the year of observation is j = -7, -4, -1, …… 5, 8, 11, 14. We use the pre-treatment year (t = -1) as the reference year. Other parameters are the same as those defined in the Equation (2).

Figures 2a – 2e, 3a, and 3b plot estimated coefficients for the main outcome variables: TDRA participation, TDRA contributions, and TDRA balances. The coefficients for the pre-treatment period (t < 0) are not statistically significant for all outcomes across household income quartiles.[15] Therefore, we are confident of minimal, if any, bias in estimates from the DiD and event study models.

Results

TDRA Contributions

We start by presenting results from the DiD models that estimate the effect of the Catch-up Contribution provision on TDRA participation and contributions, using the full sample. Table 2 reports the main coefficient of interest from the regression model as described in the Equation (1) for the main outcome variables: TDRA participation (Column 1), TDRA contributions (Column 2-3), and TDRA contributions conditioned on participating in a workplace TDRA (Column 4-5). For TDRA contributions, we report regression results for two samples: unwinsorized and winsorized at 5/95.

As shown in the Column 1 of Table 2, the Catch-up Contribution provision led to 5 percentage points (ppts) (or 11 percent) increase in TDRA participation among workers 50 and older although the estimate is only marginally statistically significant. Column 2 provides the estimate for TDRA contributions. We find that TDRA contributions increase by $699 (or 30

[15] One exception is the coefficient for TDRA participation for t = -7 among 50th – 75th group is marginally significant.

percent) following the adoption of the Catch-up Contribution policy (Column 2). However, in Column 3 in which data is winsorized at 5/95 indicates the effect size is half of the effect estimated using the unwinsorized sample. The pattern of effects is similar in models that condition on having a workplace TDRA though the estimate becomes insignificant when winsorizing at 5/95. These results suggest that the policy had positive effects on both participation and contributions, and that high variance in contributions could explain differences in effect sizes across models.

Now we turn to our estimates from our main specification, the triple DiD models as specified in Equation (2). Table 3 summarizes the coefficients of interest ($\boldsymbol{\beta_{12} + \beta_{123}}$) that estimate the impact of the Catch-up Contribution provision on workers in four different income quartiles. Since the Catch-up Contribution provision was primarily designed to improve retirement preparedness among those approaching retirement, the rest of this section focuses on results for contributions to workplace TRDAs.

Across all specifications, we find strong evidence that the policy led to an increase in TDRA contributions among individuals in the 75th quartile. Among the other three income quartiles, contributions declined. These results persist in the both the unconditional sample and the sample that conditions on TDRA participation. In particular, for workers in the 75th quartile, we find that following the adoption of the Catch-up Contribution provision, workers 50+ increased contributions in the range of \$1,413 to \$2,365[16] ($\boldsymbol{\beta_{12} + \beta_{123}}$) or between 29 to 48 percent, respectively, compared to similar workers under the age of 50 (Column 2-3). Estimates from conditional models are consistent and statistically significant, with roughly \$2,045 (or 25 percent) increase in contributions (Column 4). Again, the effect diminishes in samples winsorized at 5/95 percentile – our preferred models. The result indicates an 18 percent increase in TDRA

[16] \$1,413 = 1,570.67 - \$157.69; \$2,365 = \$2,511.39 - \$146.07

contributions among 50+ workers compared to those below age 50. The event-study models further show that the impact persists over time, especially 5 years following the Catch-up Contribution provision (see Figure 2d and 2e). The larger impact of the policy observed over post-treatment years can be attributed partly to escalation in contributions and Catch-up limit increases as well as rise in real income among the high-income group.[17]

In contrast, we observe a decline in TDRA contributions in both unconditional and conditional models for other income groups. We discuss estimates from conditional TDRA models using the winsorized 5/95 samples. The results (as presented in Panel B and Panel C of Column 5) indicate that the policy led to lower savings for middle and lower-middle income workers, in the range of $494 to $990 (or 10 to 26 percent). We do not observe substantial differences across different winsorized samples, suggesting the estimates for these income groups are not influenced by extreme values. For the lowest income group (< 25th income quartile), there is no detectable effect on TDRA contributions (see panel D – columns 4 - 5).

Additionally, we find that the policy had long-run effects, the event-study analysis shows that TDRA contributions for workers in the 75th quartile increased up to 5 years after the adoption of the policy (see Figures 2a and 2e) but contributions have declined since 2010 for all income groups. The drop in contributions after 2010 coincides with the onset of the Great Recession in 2008 suggesting that the recession affected older adults' contribution decisions. This finding concurs with earlier studies on the impact of the Great Recession on older adults' retirement security. For instance, Munnell and Rutledge (2013) find that the Great Recession had a profound

[17] Figure 5 provides the estimates for this group by ages, showing that the effect is peak at age 58, then diminished at age 63 when older workers are prepared to retire.

effect on the retirement security of older adults because of decline in returns to retirement assets, loss in home equity and job losses, all of which contributed to a drop in retirement wealth.

To gauge the size of the estimated impact on contribution levels, we compare our findings with those in two related studies. Our findings are broadly consistent with both Rutledge et al. (2016) and Lavecchia (2018). Compared to findings in Rutledge et al. (2016), our point estimate is roughly double. More specifically, we find that the Catch-up Contribution provision led to a $1,485 increase in contributions to TDRAs for upper income earners while Rutledge et. al. estimate that contributions increased by $818 for those contributing at the pre-policy max limit. Similar to Lavecchia (2018),[18] we find that the policy had long-run effects in terms that effect sizes increase significantly 9 years after policy enactment. We posit that the estimates of short- and long-run effects in this study are more precise because of the longer time period and use of SCF data which oversamples middle- and high-income households, that as described previously, have stronger incentives for policy response, while the SIPP data used in Rutledge et al. (2016) and Lavecchia (2018) oversamples low-income households and both studies use data over shorter time spans.

Retirement Asset Accumulation and "Crowd-out" Effects

Apart from contributions, performance of retirement asset portfolios is also affected by factors like market conditions, individual financial behaviors, income shocks, and pre-retirement withdrawal. Nevertheless, to the extent that the treated and comparison group face the same market conditions and that constraints on withdrawing from retirement accounts make it difficult to realize income

[18] In his study, Lavecchia used similar data to Rutledge et al. (2016) but with a different empirical approach (i.e. RDD approach).

from these accounts before age 59 ½,[19] we hypothesize that changes in contributions, either positively or negatively, will affect retirement account balances. We test this expectation by estimating the effect of the Catch-up Contribution provision on retirement asset accumulation measured by TDRA balances for both individuals and households. As discussed earlier, due to high variance in financial data, we discuss findings using the sample winsorized at the 5/95th percentile.

TDRA Balance

Beginning with TDRA balances, as presented in Table 4, we observe increases in overall retirement account balances for all income quartiles (though the estimate for 50-75th group is statistically insignificant), but gains are largest for those in the 75th income quartile. We estimate that TDRA balance increased by roughly $45,086 (or 55 percent) for individuals and by $54,736 (or 50 percent) for households after adoption of the Catch-up Contribution provision (Panel A – Column 2 and 4). We conduct several robustness tests (presented in Appendix B) to verify the substantially large effect estimated.[20] One explanation for the observed effect is that TDRA balances tend to grow quickly over the years leading to higher accumulated balances because these accounts include contributions from both workers and employers. This is especially the case for high-earners that tend to work in companies that provide employer-matched contributions as an employee benefit. This explanation is borne out by the increase in TDRA contributions we observe for this group. Additionally, our event study models suggest that the impact on accumulated

[19] A study by Bryant, Holden, and Sabelhaus (2010) used tax return data and showed that the aggregate withdrawal from DC plans in a single year among households under age 60 was very low, about 2.5 percent of the aggregate DC account balances.

[20] Note: we cannot rule out that fewer data points and small number of observations in the pre-policy period could influence the estimated effect size.

balances occurred at least 5 years after policy adoption and balances continued to increase in subsequent periods (Figure 3b).

For lower income groups, we observe that TDRA balances increased for households in the 25th and in the 25th to 50th quartiles. Adoption of the Catch-up Contribution provision led to an increase of $9,017 (or 44 percent) in TDRA balance for households in 25th - 50th quartile (Panel C – Column 4) and an increase of $521 (or 9 percent) for households in <25th quartile (Panel D – Column 4). These gains in accumulated TDRA assets for households not in the highest income quartile could be explained by growth in account balances from investment returns as opposed to growth in retirement contributions.

Total Retirement Assets and Non-Retirement Savings Assets

Next, we investigate how the policy affected household total retirement assets measured as the sum of TDRA and IRA balances.[21] In addition to retirement assets, we also examine the policy impact on non-retirement savings at the household level[22] to identify if the policy led to crowd-out of other forms of household savings. Table 5 reports the main effects from the triple DiD models as specified in Equation (2).

Surprisingly, we find that the Catch-up Contribution policy led to higher retirement assets among households below the median household income and had a lesser effect on total retirement assets of households above the median household income. For households in the top income quartile (>=75th percentile), we find that the policy led to significant increases in retirement assets

[21] Note that Catch-up policy is also applicable to contributions to IRA. However, SCF does not provide information on contributions to IRA. Therefore, we estimate IRA balances and TDRA balances together as overall retirement assets.

[22] Information on non-retirement savings balance is only available at household level.

when using the unwinsorized sample (Panel A, Column 1, Table 5), but the effect size reduces when using the sample winsorized at the 5th and 95th percentile and become statistically insignificant (Panel A, Column 2, Table 5).

However, our results for below median-income groups indicate that the Catch-up Contribution policy is associated with significant increase in retirement assets. In our preferred model, we find that retirement assets increased by an average of $7,919 (or 26 percent) for households in the 25th to 50 percentiles of the household income distribution (Panel C, Column 3, Table 5). Similarly, there is a modest increase by $603 (or 6 percent) in retirement assets for households in the lowest income quartile (Panel D, Column 3, Table 5). These effects could be explained to the extent that this outcome includes balances for IRAs, a retirement savings vehicle that is more widely used, compared to TDRA, among lower income households seeking to save for retirement when employer-sponsored retirement plans are not available to them.[23]

Finally, we find no statistically significant effects of the Catch-up Contribution provision on non-retirement savings both across different income quantiles and for all the different measures of non-retirement savings we test. This suggests that the Catch-up Contribution policy did not increase crowd-out of non-retirement assets and led to a net gain in household financial wealth These results are consistent with findings in Goodman (2020) that the Catch-up Contribution provision does not crowd-out non-retirement savings. Taken together, our findings indicate that the Catch-up Contribution policy was effective in increasing retirement assets for households across the income distribution although there are important distinctions in the types of accounts

[23] As a robustness check, we estimate the effect of the Catch-up Contribution policy on IRA balance, our results suggest evidence of positive changes in IRA balance among households with incomes below the median. Results are presented in Table 6 of the Appendix B.

that higher-income vs. lower-income households utilize to save for retirement[24] but no evidence of decline in non-retirement savings.

Conclusion

This paper examines whether the Catch-up Contribution policy, which incentivizes adults aged 50 and over to increase contributions to Tax-Deferred Retirement Accounts (TDRAs), is an effective policy tool to improve retirement preparedness. We employ the triple DiD models that exploit a natural experiment to estimate the effect of the policy across the household income distribution. Our results indicate that the Catch-up Contribution provision led to an average increase of $1,485 (18 percent) in contributions to TDRAs among upper income households. These findings could be driven by higher access to TDRAs among high-income households consistent with previous studies (Rutledge et. al. 2016), but the effect size we estimate which is roughly double theirs can be attributed to the richer dataset – SCF – and longer analysis period used in this study.[25] More research is needed to further understand such income-based retirement savings behavior.

There are several caveats from this study. First, as mentioned earlier, the SCF's survey design does not allow us to observe workers who were constrained by pre-policy contribution limit, and therefore, would be likely most affected by the policy. Second, the relatively small sub-group sample sizes in the SCF do not permit exploration of policy effects by race, education, gender, or other demographic characteristics that are likely to drive savings behavior. Lastly, state policies such as retirement income exemptions could influence TDRA and retirement assets

[24] We conduct several robustness tests for the main outcomes using bootstrapped sample errors and different age intervals. Our findings are consistent across all robustness tests.

[25] Rutledge et al. (2016) find that workers over age 50 constrained by the maximum deferral level increase their contributions by about $818 more than similar workers who were under 50 following the Catch-up provision.

differentially across individuals in different states, but we are unable to capture these variables because the public SCF data does not provide information on the state of residency.

Despite these limitations, our study is the first to examine the effect of the Catch-up Contribution provision on households across the income distribution. Our findings suggests that tax incentives are an effective policy tool in promoting retirement savings especially for adults nearing retirement and that tax incentives targeted toward improving retirement have a positive impact on households of all incomes as opposed to benefiting only high-income individuals as documented in previous studies. The effectiveness of tax incentives for retirement savings is further underscored by the absence of crowd-out of non-retirement savings as demonstrated in this study and previous research on the Catch-up Contribution provision (Goodman, 2020). Future research on the impact of the Catch-up Contribution provision on household consumption, labor supply, and financial wellbeing will provide insights on impact of statutory limit changes on household financial decisions.

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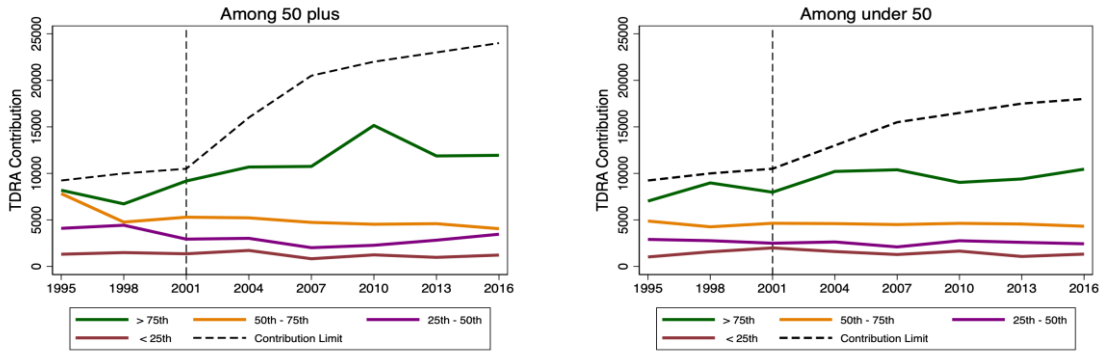
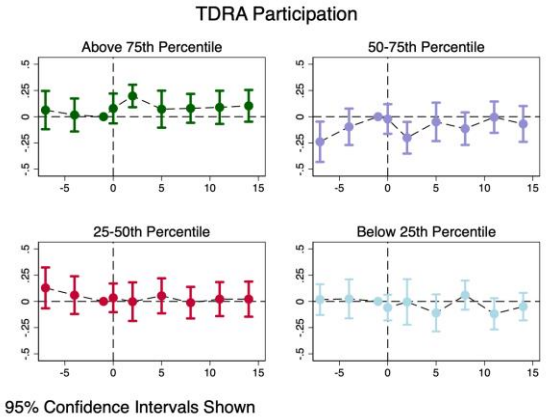
Figure 1. Conditional TDRA Contributions by Income Quartile, Compared with Contribution Limits



Notes: Data comes from the SCF 1995-2016, aggregated by income quartiles: >=75th, 50th -75th, 25th -50^{th,} and < 25th. All figures are adjusted by sample weighted and inflated in 2016 dollars.

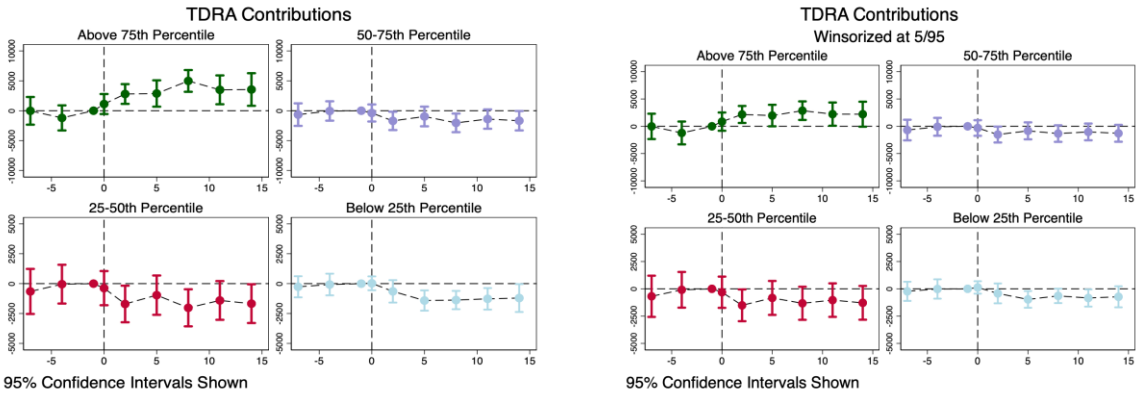
Figure 2. Event Study Model Results for TDRA participation and contributions

Figure 2a. TDRA Participation



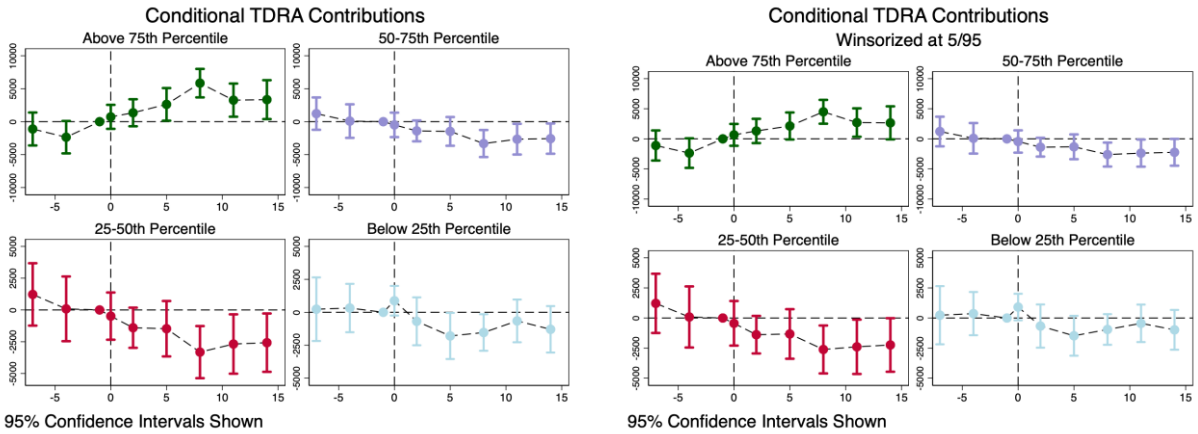
Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. Each dot and its 95% confidence intervals present the coefficients - β_{123} - from the event study regression model as in the Equation (3). Each graph shows the coefficient estimates for each income group: >=75th, 50th – 75th, 25th – 50th, and < 25th of the household income distribution. Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. The model also controls for year fixed effects. Standard errors are clustered at birth year cohorts. All monetary values are deflated in 2016 dollars. All estimates use sample weights.

Figure 2b. Unconditional TDRA Contributions



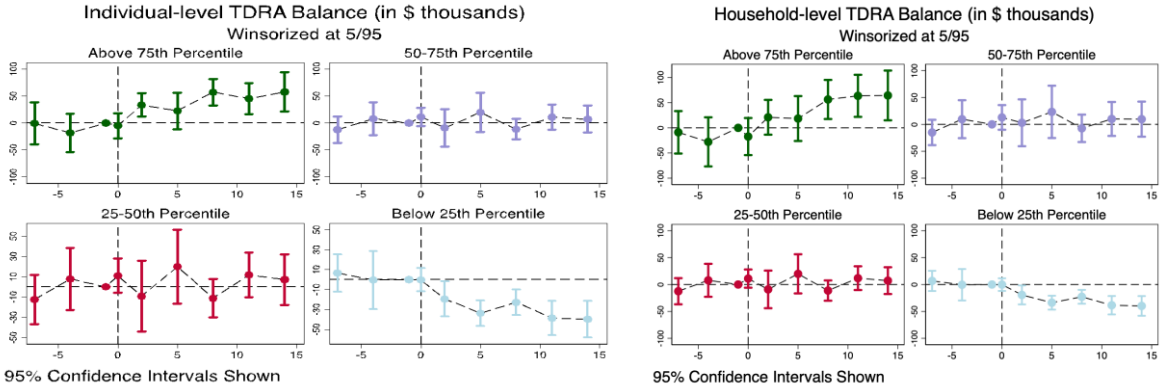
Note: Outcome variable: TDRA participation. Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. Each dot and its 95% confidence intervals present the coefficients - β_{123} - from the event study regression model as in the Equation (3). Each graph shows the coefficient estimates for each income group: >=75th, 50th – 75th, 25th – 50th, and < 25th of the household income distribution. Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. The model also controls for year fixed effects. Standard errors are clustered at birth year cohort. All monetary values are deflated in 2016 dollars. All estimates use sample weights.

Figure 2c. Conditional TRDA Contributions



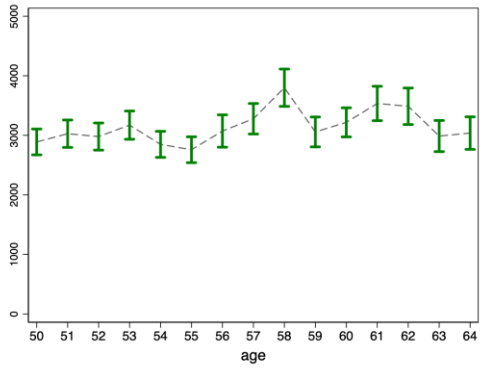
Note: Outcome variable: TDRA contributions conditioning on having an account. Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. Each dot and its 95% confidence intervals present the coefficients - β_{123} - from the event study regression model as in the Equation (3). Each graph shows the coefficient estimates for each income group: >=75th, 50th – 75th, 25th – 50th, and < 25th of the household income distribution. Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. The model also controls for year fixed effects. Standard errors are clustered at birth year cohort. All monetary values are deflated in 2016 dollars. All estimates use sample weights.

Figure 3. Event Study Model Results for TDRA balances



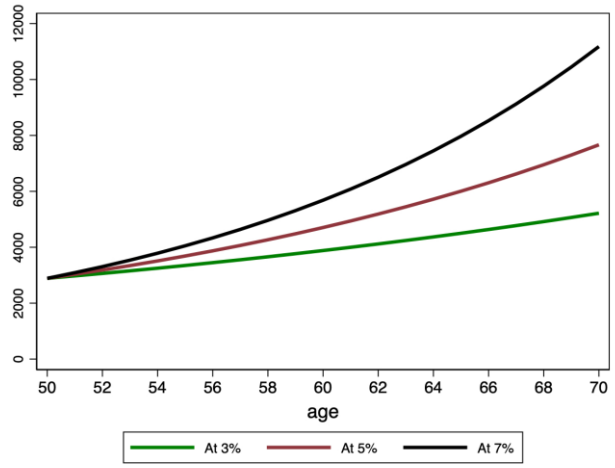
Note: Outcome variable: TDRA balance winsorized at 5/95. Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. Each dot and its 95% confidence intervals present the coefficients - β_{123} - from the event study regression model as in the Equation (3). Each graph shows the coefficient estimates for each income group: >=75th, 50th – 75th, 25th – 50th, and < 25th of the household income distribution. Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. The model also controls for year fixed effects. Standard errors are clustered at birth year cohort. All monetary values are deflated in 2016 dollars. All estimates use sample weights.

Figure 4. Predictive Marginal Effects on TRDA Contributions by Age



Note: Each dot and its associated 95% confidence intervals present marginal net effect on TDRA contributions at each age is post-estimation from the triple DID model as in the Equation (2) for the highest income group (>=75th of the household income distribution). Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working.

Figure 5. Projected Marginal Effects at Different Interest Rates



Notes: Each line projects predicted additional increase in TDRA assets due to net marginal effect of the Catchup Provisions at age 50 at each hypothetical interest rate for workers in the highest income group. The net marginal effect of the Catchup Provisions on TDRA contributions at age 50 is a post-estimation from the triple DID model as in the Equation (2) for the highest income group (>=75th of the household income distribution). Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working.

Table 1. Summary Statistics.

	Mean	SD	Min	Max
Outcome Variables				
TDRA Participation	0.459	0.498	0	1
TDRA Contributions	2,413.81	4,623.12	0	26,409.90
Conditional TDRA Contributions	5,259.25	5,621.87	0	26,409.90
TDRA Balance - Individual	47,286.67	180,726.50	0	14,800,000
TDRA Balance - Household	57,650.32	202,672.50	0	14,800,000
IRA Balance - Individual	13,380.69	95,177.08	0	14,800,000
IRA Balance - Household	18,710.29	109,578.60	0	14,800,000
Household Retirement Assets	76,360.61	243,102.00	0	14,900,000
Household Other Savings	14,097.89	103,871.90	0	51,700,000
Demographics				
Age	43.035	10.449	25	64

Female	0.226	0.418	0	1
Married	0.570	0.495	0	1
White	0.706	0.456	0	1
Black	0.136	0.342	0	1
Hispanic	0.111	0.314	0	1
Other races	0.047	0.212	0	1
Household size	2.917	1.504	1	12
Number of children under 18	0.909	1.164	0	8
Educational Attainment				
High school or Less	0.378	0.485	0	1
Some College	0.255	0.436	0	1
College Degree	0.225	0.417	0	1
Graduate Degree	0.142	0.349	0	1
Firm size				
Less than 10	0.085	0.279	0	1
10 - 19	0.063	0.244	0	1
20 - 99	0.164	0.370	0	1
100 - 499	0.177	0.382	0	1
More than 500	0.510	0.500	0	1
Number of working years	9.080	8.499	1	50
Whether Household had a DB plan	0.279	0.449	0	1
Whether Spouse hold a BA or above degree	0.233	0.423	0	1
Home ownership	0.675	0.468	0	1
Whether expecting to receive inheritance	0.161	0.367	0	1
Expectation about income in retirement				
Total Inadequate	0.279	0.448	0	1
Inadequate	0.199	0.399	0	1
Enough to maintain living standards	0.340	0.474	0	1
Satisfactory	0.108	0.310	0	1
Very Satisfactory	0.075	0.263	0	1
N		10,172		

Notes: Data comes from the Survey of Consumer Finance. Sample includes workers aged 25 – 64 years old, with at least one year of tenure. Summary statistics represents the average of 1995-2016 SCF with survey weights. All monetary values are deflated in 2016 dollars.

Table 2. Difference-in-Difference Regression Results.

	(1)	(2)	(3)	(4)	(5)
	TDRA participation	TDRA contribution		Conditional TDRA Contribution	
		Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95
Age50 x Catchup	0.050*	699.12***	398.76**	561.73*	329.85
	{0.0284}	{206.59}	{184.44}	{322.59}	{302.02}
Pre-Policy Mean	*0.4378*	*2,352*	*2,352*	*5,373*	*5373.343*
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Individual Characteristics Controls	Yes	Yes	Yes	Yes	Yes
N	10,172	10,172	10,172	4,772	4,772

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catch-up (indicator for years after 2001). Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quintile in the pre-policy period is in italics. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$).

Table 3. Triple Differences Estimation Results

	(1)	(2)	(3)	(4)	(5)
	TDRA participation	TDRA contribution		Conditional TDRA contribution	
		Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95
Panel A. Family Income >= 75th					
Age50 x Catchup	0.034	-146.07	-157.69	-613.12**	-620.29**
	{0.0334}	{163.01}	{162.89}	{261.60}	{261.63}
Age50 x Catchup x Income75th	0.039	2,511.39***	1,570.67***	2,658.38***	2,104.90***
	{0.0451}	{562.92}	{478.16}	{797.65}	{735.65}
Pre-Policy Mean	*0.5987*	*4,880*	*4,880*	*8,150*	*8,150*
N	10,172	10,172	10,172	4,772	4,772
Panel B. Family Income in 50th - 75th					
Age50 x Catchup	0.040	839.67***	463.73*	1,004.78**	697.43*
	{0.0345}	{273.36}	{245.78}	{426.22}	{395.67}
Age50 x Catchup x Income5075th	0.018	-759.90*	-457.49	-1,452.67**	-1,191.39**
	{0.0530}	{411.21}	{393.38}	{596.83}	{567.68}
Pre-Policy Mean	*0.4823*	*2,495*	*2,495*	*5,173*	*5,173*
N	10,172	10,172	10,172	4,772	4,772
Panel C. Family Income in 25th - 50th					
Age50 x Catchup	0.055*	933.02***	537.20**	1,031.34**	722.63*

	{0.0286}	{275.44}	{242.50}	{394.64}	{368.71}
Age50 x Catchup x Income2550th	-0.034	-1,271.33***	-853.27**	-2,059.21***	-1,713.22***
	{0.0669}	{384.71}	{355.99}	{657.20}	{629.76}
Pre-Policy Mean	*0.4085*	*1,567*	*1,567*	*3,835*	*3,835*
N	10,172	10,172	10,172	4,772	4,772
Panel D. Family Income < 25th					
Age50 x Catchup	0.055	858.71***	480.71*	667.70*	405.17
	{0.0344}	{280.13}	{246.79}	{362.50}	{337.98}
Age50 x Catchup x Income25th	-0.042	-1,019.02***	-628.61**	-795.36	-532.75
	{0.0617}	{285.75}	{246.97}	{626.82}	{592.22}
Pre-Policy Mean	*0.2400*	*331*	*331*	*1,377*	*1,377*
N	10,172	10,172	10,172	4,772	4,772

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is triple DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catch-up (indicator for years after 2001), and the triple interaction of Age50, Catchup, and indicator of corresponding income quintile. Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quintile in the pre-policy period is in italics. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** (p<0.001), ** (p<0.01), * (p<0.05).

Table 4. Triple Differences Regression Results – TDRA Balance

	(1)	(2)	(3)	(4)
	Individual TDRA Balance		Household TDRA Balance	
	Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95
Panel A. Family Income >= 75th				
Age50 x Catchup	12,662.77**	12,966.97***	16,483.62***	16,690.29***
	{4,895.05}	{2,863.50}	{5,246.94}	{3,264.22}
Age50 x Catchup x Income75th	89,785.35***	32,101.51***	116,561.74***	38,045.84***
	{33,660.34}	{8,769.14}	{38,575.85}	{12,576.57}
Pre-Policy Mean	*146,949*	*81,378*	*176,144*	*109,230*
N	10,172	10,172	10,172	10,172
Panel B. Family Income in 50th - 75th				
Age50 x Catchup	41,411.68***	21,621.70***	53,474.36***	26,202.94***
	{10,997.50}	{4,175.59}	{13,082.92}	{5,947.02}
Age50 x Catchup x Income5075th	-8,799.21	6,881.27	-10,293.11	11,136.52
	{15,574.79}	{7,634.41}	{17,190.48}	{9,028.76}
Pre-Policy Mean	*40,838*	*34,341*	*47,016*	*41,431*
N	10,172	10,172	10,172	10,172
Panel C. Family Income in 25th - 50th				
Age50 x Catchup	49,140.06***	28,489.94***	63,793.43***	34,982.95***
	{1,1361.35}	{3,519.76}	{13,299.86}	{5,439.96}
Age50 x Catchup x Income2550th	-4,3507.87***	-21,885.22***	-56,539.46***	-25,966.08***
	{14,622.80}	{6,486.85}	{16,045.13}	{7,369.00}
Pre-Policy Mean	*20,023*	*20,023*	*20,287*	*20,287*

N	10,172	10,172	10,172	10,172
Panel D. Family Income < 25th				
Age50 x Catchup	50,498.03***	29,306.86***	65,815.41***	36,832.61***
	{11,197.32}	{4,283.97}	{13,445.64}	{6,080.08}
Age50 x Catchup x Income25th	-53,071.43***	-27,833.31***	-69,926.85***	-36,311.09***
	{14,302.79}	{6,026.90}	{16,524.70}	{7,467.96}
Pre-Policy Mean	*7,926*	*5,435*	*7,980*	*5,702*
N	10,172	10,172	10,172	10,172

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is triple DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catchup (indicator for years after 2001), and the triple interaction of Age50, Catchup, and indicator of corresponding income quintile. Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quantile in the pre-policy period is in italics. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$).

Table 5. Triple Differences Regression Results – "Crowd out" Effects

	(1)	(2)	(3)	(4)
	Household Retirement Assets		Household Other Savings	
	Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95
Panel A. Family Income >= 75th				
Age50 x Catchup	15,097.01**	13,461.54***	-1,378.72	-1,516.53*
	{6,977.04}	{4,319.25}	{1,570.78}	{786.95}
Age50 x Catchup x Income75th	92,914.62*	23,511.86	4,505.44	1,160.14
	{48,073.36}	{15,053.82}	{21,406.48}	{3,230.70}
Pre-Policy Mean	*306,024*	*213,354*	*52,863*	*22,036*
N	10,172	10,172	10,172	10,172
Panel B. Family Income in 50th - 75th				
Age50 x Catchup	46,508.10***	19,785.69***	2,097.51	-823.61
	{15,512.42}	{6,852.28}	{6,967.73}	{1,157.05}
Age50 x Catchup x Income5075th	-5,845.62	9,915.66	-1,576.70	888.97
	{23,013.27}	{11,555.99}	{8,346.51}	{2,020.10}
Pre-Policy Mean	*79,936*	*76,146*	*14,042*	*11,071*
N	10,172	10,172	10,172	10,172
Panel C. Family Income in 25th - 50th				
Age50 x Catchup	55,097.28***	25,910.90***	2,117.57	-345.52
	{14,877.82}	{6,218.91}	{6,906.54}	{1,217.34}
Age50 x Catchup x Above Income2550th	-47,573.14**	-17,991.24**	-3,516.64	-1,586.18

	{18,387.89}	{8,752.28}	{7,588.78}	{1,899.06}
Pre-Policy Mean	*30,905*	*30,905*	*6,590*	*6,444*
N	10,172	10,172	10,172	10,172
Panel D. Family Income < 25th				
Age50 x Catchup	58,878.50***	28,190.99***	2,824.04	-40.45
	{15,089.08}	{6,815.72}	{6,384.26}	{1,128.28}
Age50 x Catchup x Below Income25th	-63,865.96***	-27,587.12***	-5,882.16	-2,880.07
	{19,086.89}	{8,326.54}	{6,650.31}	{1,985.77}
Pre-Policy Mean	*11,213*	*9,638*	*5,159*	*4,815*
N	10,172	10,172	10,172	10,172

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is triple DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catchup (indicator for years after 2001), and the triple interaction of Age50, Catchup, and indicator of corresponding income quintile. Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quantile in the pre-policy period is in italics. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$).

APPENDIX

Appendix A: Description of Retirement and Non-Retirement Asset variables

1. TDRA Participation

This outcome is a binary variable that takes the value 1 if the respondent participated in any tax-deferred retirement account in their workplace from one or more current jobs, and 0 otherwise. We exclude employees who may be in full-time jobs but are ineligible to participate in a workplace TDRA due to plan-specific or employer-specific tenure-based participation requirements.

2. TDRA Contributions

The outcome variable – TDRA contributions – is derived from questions in the SCF that ask how much and how frequently the respondent contributed to a TDRA in their current main job after considering the actual weeks that the respondent worked during a normal year. The total retirement contribution amount is the sum of all contributions to one or more plans that the respondent participates in with their current main employer. Since the survey normally asks about up to three main plans, the contribution amount is aggregated into an annual contribution for consistency across the sample. This drops individuals who may have contributed to a TDRA but are employed for less than a year. Finally, we only include contributions for individuals that are eligible to participate in TDRAs, for this group we examine both unconditional and conditional TDRA contributions.

3. Tax-deferred Retirement Account Balance (TDRA Balance)

This variable is constructed using survey questions about balances in all employer-sponsored retirement plans for the respondent and their spouse/partner. Before 2010 information on balance were asked for up to 4 plans and for 3 plans after 2010. We measure TDRA balance at both the individual and household levels, individual TDRA balance is sum of all current employer-sponsored tax deferred retirement plans of the respondent, and household TDRA balance includes respondent and spouse/partner.

4. Total Retirement Assets

Total retirement assets are measured at household level, they are sum of household-level TDRA and IRA balances. While balances in employer-sponsored retirement plans are asked for respondents and spouses only, IRA balances are recorded for all household members. We measure total retirement assets by summing all balances to reflect retirement assets of the family.

5. Non-retirement Savings

Non-retirement saving is derived from all other types of savings excluding pensions the household had in the survey year. This includes traditional (taxable) savings, 529 education accounts, savings in market money account or savings in other accounts. Before 2001, the SCF did not provide details on types of saving but since 2004 more details about types of saving were asked. For example, survey questions asked whether the saving accounts were college saving plans (529 plan) or medical saving plans or bank-deposit type plans. For consistency, we construct non-retirement savings variable that contain all types of non-retirement savings for each year during 1995 – 2016.

Appendix B: Robustness Tests

We examine sensitivity of the estimates by conducting several robustness tests. Because we are interested in the effects of the Catch-up Contribution provision on contributions, we discuss the findings for this outcome. The results are reported in Table 1 – 4. First, we estimate DiD models when the sample is split by household income quantiles: >=75^{th}, 50 – 75^{th}, 25^{th}- 50^{th}, and < 25^{th}. Consistently, we find strong evidence of the positive impact of the policy on TDRA contributions among the highest income group (those in 75^{th} quantile), for both unconditional and conditional models. For lower income groups, the DiD models indicate lower TDRA contributions among middle and lower-middle income groups in conditional models (50^{th} – 75^{th} and 25^{th} – 50^{th} groups) and no detectable impact on the lowest income group (Table 1).

Second, we use alternative age windows: ages 30-60 and ages 40-60. We re-estimate the triple DiD models with the same specification as the preferred model for these samples. When we limit the sample to workers aged 30 – 60, the estimated results are similar to the baseline results, yet the coefficients become larger for all groups across the income distribution. However, using the 40 – 60-year-old sample, the estimates become less statistically significant but remain unchanged in direction, especially when the outcomes are winsorized at 5/95. This loss of statistical significance could be because of smaller sample sizes than in the baseline models. Nevertheless, we find strong evidence of positive impact on contributions to TDRAs among the highest income group. (Table 4 and Table 5).

Third, we re-estimate equation (2) using a bootstrap sampling approach (Cameron et al., 2008) given the small size of our main analytic sample. For each outcome variable, we simulate 1,000 times using the same specification as the baseline model. The

bootstrapped estimation supports results from the preferred models indicating the estimates are robust (Table 2 and 3). In sum, the robustness checks in this section reconfirm our findings that the heterogeneous effects of the Catch-up provision are present across the income distribution. Workers in the highest income group are more likely to increase contributions to TDRAs than households with lower income.

Table 1. DID Regression Results – By Income Distribution

	(1)	(2)	(3)	(4)	(5)
		TDRA contribution		Conditional TDRA contribution	
	TDRA participation	Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95
Panel A. Family Income >= 75th					
Age50 x Catchup	0.098**	2,491.01***	1,558.96***	2,144.62**	1,587.12**
	{0.0393}	{596.68}	{497.77}	{805.64}	{741.41}
Pre-Policy Mean	*0.5987*	*4,880*	*4,880*	*8,150*	*8,150*
N	2,644	2,644	2,644	1,793	1,793
Panel B. Family Income in 50th - 75th					
Age50 x Catchup	0.062	-114.53	-161.13	-887.36**	-919.64**
	{0.0401}	{319.38}	{314.89}	{376.23}	{372.89}
Pre-Policy Mean	*0.4823*	*2,495*	*2,495*	*5,173*	*5,173*
N	2,543	2,543	2,543	1,397	1,397
Panel C. Family Income in 25th - 50th					
Age50 x Catchup	0.011	-426.09	-417.12	-1,073.08**	-1060.90**
	{0.0673}	{272.27}	{272.08}	{443.44}	{441.50}

Pre-Policy Mean	*0.4085*	*1,567*	*1,567*	*3,835*	*3,835*
N	2,543	2,543	2,543	1,045	1,045
Panel D. Family Income < 25th					
Age50 x Catchup	0.018	12.92	9.88	129.23	124.37
	{0.0493}	{87.58}	{87.72}	{251.40}	{250.82}
Pre-Policy Mean	*0.2400*	*331*	*331*	*1,377*	*1,377*
N	2,442	2,442	2,442	537	537
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Individual Characteristics Controls	Yes	Yes	Yes	Yes	Yes

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catchup (indicator for years after 2001). Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quantile in the pre-policy period is in italics. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$).

Table 2. Triple DID Regression Model with Bootstrap Sampling - TDRA Contributions

	(1)	(2)	(3)	(4)	(5)	(6)
		Baseline			Bootstrap Sampling	
	TDRA participation	TDRA contribution Winsorized at 5/95	Conditional TDRA contribution Winsorized at 5/95	TDRA participation	TDRA contribution Winsorized at 5/95	Conditional TDRA contribution Winsorized at 5/95
Panel A. Family Income >= 75th						
Age50 x Catchup	0.034	-157.69	-620.28734**	0.047	-43.02	-480.71*
	{0.0334}	{162.89}	{261.63}	{0.0340}	{160.37}	{289.54}
Age50 x Catchup x Income75th	0.039	1,570.67***	2,104.90***	-0.038	622.57	1,772.35***
	{0.0451}	{478.16}	{735.65}	{0.0378}	{413.99}	{635.77}
N	10,172	10,172	4,772	10,172	10,172	4,772
Panel B. Family Income in 50th - 75th						
Age50 x Catchup	0.040	463.73*	697.43*	0.028	368.98	928.52***
	{0.0345}	{245.78}	{395.67}	{0.0292}	{257.50}	{338.72}
Age50 x Catchup x Income5075th	0.018	-457.49	-1,191.39**	0.047	-177.44	-1,359.77**
	{0.0530}	{393.38}	{567.68}	{0.0483}	{404.86}	{580.02}
N	10,172	10,172	4,772	10,172	10,172	4,772
Panel C. Family Income in 25th - 50th						
Age50 x Catchup	0.055*	537.20**	722.63*	0.040	451.85*	917.12***
	{0.0286}	{242.50}	{368.71}	{0.0252}	{256.16}	{351.02}

Age50 x Catchup x Income2550th	-0.034	-853.27**	-1,713.22***	0.004	-629.99*	-1,852.50***
	{0.0669}	{355.99}	{629.76}	{0.0566}	{334.48}	{663.24}
N	10,172	10,172	4,772	10,172	10,172	4,772
Panel D. Family Income < 25th						
Age50 x Catchup	0.055	480.71*	405.17	0.047	453.24*	637.41*
	{0.0344}	{246.79}	{337.98}	{0.0297}	{273.89}	{330.77}
Age50 x Catchup x Below Income25th	-0.042	-628.61**	-532.75	-0.043	-536.64*	-428.74
	{0.0617}	{246.97}	{592.22}	{0.0539}	{285.75}	{764.04}
N	10,172	10,172	4,772	10,172	10,172	4,772

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catchup (indicator for years after 2001). Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age cohort level, and the means of the dependent variable among the over 50 groups in each income quantile in the pre-policy period is in italics. Bootstrapping models are based on 1,000 replication times. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$).

Table 3. Triple DID Regression Model with Bootstrap Sampling - Household-level Savings

	(1)	(2)	(3)	(4)
	Baseline		Bootstrap Sampling	
	TDRA Balance	Non-retirement Savings	TDRA Balance	Non-retirement Savings
Panel A. Family Income >= 75th				
Age50 x Catchup	16,690.29***	-1,516.53*	19,599.09***	-1,501.95
	{3,264.22}	{786.95}	{3,478.81}	{939.76}
Age50 x Catchup x Income75th	38,045.84***	1,160.14	18,949.00	1,454.31
	{12,576.57}	{3,230.70}	{13,531.97}	{4,127.64}
N	10,172	10,172	10,172	10,172
Panel B. Family Income in 50th - 75th				
Age50 x Catchup	26,202.94***	-823.61	21,951.26***	89.1
	{5,947.02}	{1,157.05}	{6,849.74}	{1,891.15}
Age50 x Catchup x Income5075th	11,136.52	888.97	23,249.70**	-396.3
	{9,028.76}	{2,020.10}	{9,937.25}	{2,775.17}
N	10,172	10,172	10,172	10,172
Panel C. Family Income in 25th - 50th				
Age50 x Catchup	34,982.95***	-345.52	31,742.61***	234.84
	{5,439.96}	{1,217.34}	{6,491.61}	{1,926.48}

Age50 x Catchup x Income2550th	-25,966.08***	-1,586.18	-21,909.59***	-1,808.54
	{7,369.00}	{1,899.06}	{7,626.75}	{2,546.07}
N	10,172	10,172	10,172	10,172
Panel D. Family Income < 25th				
Age50 x Catchup	3,6832.61***	-40.45	34,025.87***	517.15
	{6,080.08}	{1,128.28}	{6,509.14}	{1,768.43}
Age50 x Catchup x Below Income25th	-36,311.09***	-2,880.07	-34,569.99***	-2,904.57
	{7,467.96}	{1,985.77}	{7,663.96}	{2,202.10}
N	10,172	10,172	10,172	10,172

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catchup (indicator for years after 2001). Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quantile in the pre-policy period is in italics. Bootstrapping models are based on 1,000 replication times All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$).

Table 4. TDRA Contributions – Different Age Samples

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline		Sample: 30 - 60		Sample 40 - 60	
	Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95
Panel A. Family Income >= 75th						
Age50 x Catchup	-146.07	-157.69	-153.68	-166.75	-266.09	-290.72
	{163.01}	{162.89}	{165.16}	{163.29}	{189.65}	{187.03}
Age50 x Catchup x Income75th	2,511.39***	1,570.67***	3,241.27***	2,232.46***	1,961.05**	989.37
	{562.92}	{478.16}	{718.32}	{610.72}	{873.62}	{810.46}
N	10,172	10,172	8,551	8,551	5,854	5,854
Panel B. Family Income in 50th - 75th						
Age50 x Catchup	839.67***	463.73*	874.43***	510.16**	16.43	-236.06
	{273.36}	{245.78}	{275.86}	{246.84}	{280.33}	{263.05}
Age50 x Catchup x Income5075th	-759.90*	-457.49	-662.50	-373.05	543.85	669.93
	{411.21}	{393.38}	{446.66}	{441.14}	{561.50}	{554.62}
N	10,172	10,172	8,551	8,551	5,854	5,854
Panel C. Family Income in 25th - 50th						
Age50 x Catchup	933.02***	537.20**	1,089.75***	703.66**	593.07*	277.48
	{275.44}	{242.50}	{319.6608}	{276.73}	{306.69}	{272.23
Age50 x Catchup x Income2550th	-1,271.33***	-853.27**	-1539.94826***	-1,143.18***	-1,428.69***	-1,092.42**

	{384.71}	{355.99}	{446.82}	{406.14}	{459.10}	{425.77}
N	10,172	10,172	8,551	8,551	5,854	5,854
Panel D. Family Income < 25th						
Age50 x Catchup	858.71***	480.71*	972.05***	592.04**	421.34	102.57
	{280.13}	{246.79}	{296.14}	{255.98}	{300.03}	{268.34}
Age50 x Catchup x Below Income25th	-1,019.02***	-628.61**	-1,154.06***	-746.82***	-720.35*	-362.74
	{285.75}	{246.97}	{315.78}	{270.95}	{367.36}	{328.92}
N	10,172	10,172	8,551	8,551	5,854	5,854

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Full sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catchup (indicator for years after 2001). Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quantile in the pre-policy period is in italics. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$).

Table 5. Conditional TDRA Contributions – Different Age Samples

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline		Sample: 30 - 60		Sample 40 - 60	
	Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95
Panel A. Family Income >= 75th						
Age50 x Catchup	-613.12**	-620.29**	-627.38**	-635.44**	-740.74**	-750.84**
	{261.60}	{261.63}	{289.72}	{287.59}	{335.38}	{334.22}
Age50 x Catchup x Income75th	2,658.38***	2,104.90***	3,092.82***	2,496.35**	1,974.69*	1,707.80*
	{797.65}	{735.65}	{1,031.70}	{963.93}	{1033.83}	{996.66}
N	4,772	4,772	4,158	4,158	2,983	2,983
Panel B. Family Income in 50th - 75th						
Age50 x Catchup	1,004.78**	697.43*	967.32**	663.92*	116.33	6.62
	{426.22}	{395.67}	{419.21}	{389.76}	{329.35}	{317.85}
Age50 x Catchup x Income5075th	-1,452.67**	-1,191.39**	-1,438.09**	-1,183.03*	-848.05	-779.68
	{596.83}	{567.68}	{632.30}	{603.10}	{662.00}	{655.78}
N	4,772	4,772	4,158	4,158	2,983	2,983
Panel C. Family Income in 25th - 50th						
Age50 x Catchup	1,031.34**	722.63*	1,095.60**	787.76*	111.72	-11.25
	{394.64}	{368.71}	{481.00}	{447.51}	{498.46}	{484.69}
Age50 x Catchup x Income2550th	-2,059.21***	-1,713.22***	-2,103.08***	-1,770.10**	-898.12	-772.01
	{657.20}	{629.76}	{785.79}	{747.78}	{836.03}	{821.13}

N	4,772	4,772	4,158	4,158	2,983	2,983
Panel D. Family Income < 25th						
Age50 x Catchup	667.70*	405.17	674.08*	407.86	67.97	-45.42
	{362.50}	{337.98}	{378.85}	{353.20}	{374.20}	{362.57}
Age50 x Catchup x Below Income25th	-795.36	-532.75	-906.70	-609.04	-899.63	-740.99
	{626.82}	{592.22}	{706.74}	{669.29}	{767.54}	{744.97}
N	4,772	4,772	4,158	4,158	2,983	2,983

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Full sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catchup (indicator for years after 2001). Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quantile in the pre-policy period is in italics. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$).

Table 6. Triple Differences Regression Results – IRA Balance

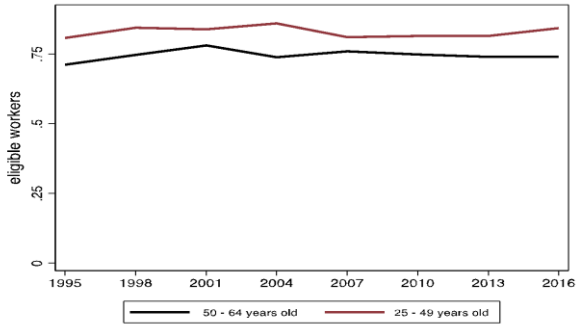
	(1)	(2)	(3)	(4)
	Individual IRA Balance		Household IRA Balance	
	Unwinsorized	Winsorized at 5/95	Unwinsorized	Winsorized at 5/95
Panel A. Family Income >= 75th				
Age50 x Catchup	-887.63	-1,658.50	-1,386.61	-3,228.75*
	{2342.74}	{1181.72}	{2926.04}	{1840.84}
Age50 x Catchup x Income75th	-12,104.59	-8,413.30*	-23,647.12	-14,533.98**
	{15,006.47}	{4,522.71}	{16,753.78}	{6,985.45}
Pre-Policy Mean	*93,454*	*34,752*	*129,880*	*59,904*
N	10,172	10,172	10,172	10,172
Panel B. Family Income in 50th - 75th				
Age50 x Catchup	-2437.99	-3,291.41***	-6965.359	-6,417.25***
	{4,113.83}	{1,170.17}	{5,149.30}	{2,095.42}
Age50 x Catchup x Income5075th	-1,565.78	-1,835.82	4,447.49	-1,220.86
	{8,162.49}	{3,521.11}	{9,536.88}	{5,141.15}
Pre-Policy Mean	*25,699*	*17,793*	*32,920*	*27,591*
N	10,172	10,172	10,172	10,172
Panel C. Family Income in 25th - 50th				
Age50 x Catchup	-5,148.37	-5,396.90***	-8,696.16*	-9,072.06***
	{3,954.18}	{1,371.32}	{4,832.36}	{2,345.58}

Age50 x Catchup x Above Income2550th	7,299.10	5,752.52**	8,966.32	7,974.84**
	{5637.62}	{2,686.57}	{6,152.13}	{3,547.02}
Pre-Policy Mean	*7,253*	*6,351*	*10,618*	*9,903*
N	10,172	10,172	10,172	10,172
Panel D. Family Income < 25th				
Age50 x Catchup	-3,478.53	-4,940.28***	-6,936.91	-8,641.62***
	{3,606.23}	{1,163.26}	{4,657.23}	{2,065.23}
Age50 x Catchup x Below Income25th	3,523.59	5,364.20***	6,060.89	8,723.97***
	{4,718.74}	{1,837.15}	{6,010.34}	{2,683.23}
Pre-Policy Mean	*2,440*	*2,440*	*3,233*	*3,233*
N	10,172	10,172	10,172	10,172

Note: Data comes from the Surveys of Consumer Finances, spanning from 1995 to 2016. Sample includes working individuals between ages of 25 and 64, with at least one year of working. The estimation model is triple DID with controls. Year fixed effects included. Each cell presents the coefficient of the interaction of Age50 (indicator for being 50 years old and above) and Catchup (indicator for years after 2001), and the triple interaction of Age50, Catchup, and indicator of corresponding income quintile. Demographic control variables include education attainment, gender, race, marital status, indicators for occupation, indicators for firm size, household size, indicator for having any child aged under 18, whether household had any DB plan, spouse's educational attainment, indicator for expectation to receive any inheritance, indicators for expectation about income in retirement (from absolutely inadequate to total satisfactory), and indicator for home ownership. Standard errors are in parentheses and clustered at age level, and the means of the dependent variable among the over 50 groups in each income quantile in the pre-policy period is in italics. All monetary values are deflated in 2016 dollars. All estimates use sample weight. Statistical significance is indicated by *** (p<0.001), ** (p<0.01), * (p<0.05).

Appendix C: Comparison of Treatment and Control Groups

Figure 1. Patterns of TRDA-eligible workers between treatment and control group.



Notes: Data comes from the SCF 1995-2016, aggregated by years and treatment status. Eligible workers are defined as individuals currently working with at least one year of job tenure at main job. All figures are adjusted by sample weights.

Figure 2. Pattern in TDRA Participation

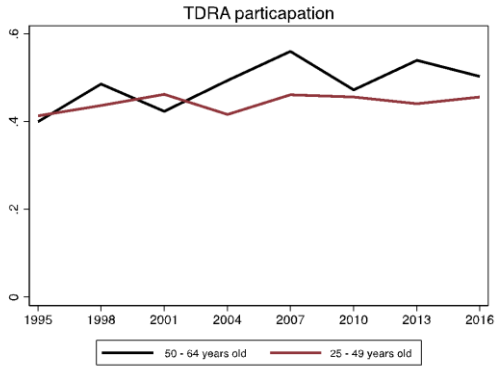
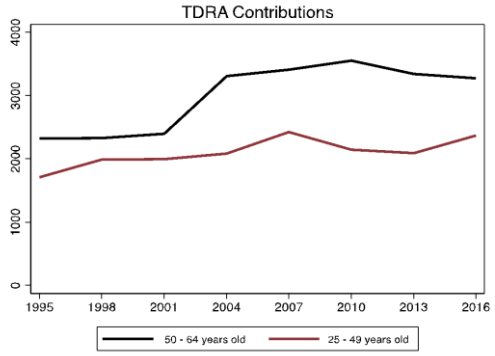
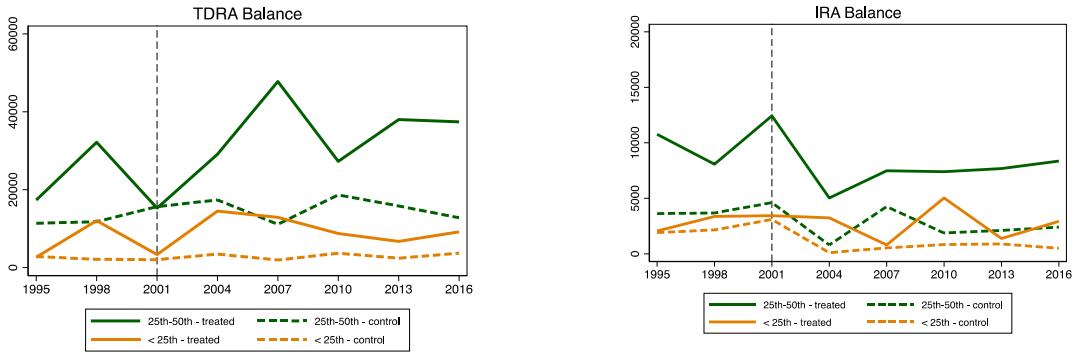


Figure 3. Pattern in TDRA Contributions



Notes: Data comes from the SCF 1995-2016, aggregated by years and treatment status. Sample includes eligible workers defined as individuals currently working with at least one year of job tenure at main job. All figures are adjusted by sample weights and inflated by 2016 dollars.

Figure 4. Household Balances among below-median income households



Note: Data comes from the SCF 1995-2016, aggregated for households with incomes in 25th-50th quantile and 25th quantile. TDRA and IRA balances are measured at household levels and adjusted by sample weighted and inflated in 2016 dollars.

Appendix D: Tax Deferral Contribution Limits

Table 1. Elective Deferrals Limits and Catch-up Limits

Year	Nominal Limits	Catch-up Limits
1995	$9,240	$-
1996	$9,500	$-
1997	$9,500	$-
1998	$10,000	$-
1999	$10,000	$-
2000	$10,500	$-
2001	$10,500	$-
2002	$11,000	$1,000
2003	$12,000	$2,000
2004	$13,000	$3,000
2005	$14,000	$4,000
2006	$15,000	$5,000
2007	$15,500	$5,000
2008	$15,500	$5,000
2009	$16,500	$5,500
2010	$16,500	$5,500
2011	$16,500	$5,500
2012	$17,000	$5,500
2013	$17,500	$5,500
2014	$17,500	$5,500
2015	$18,000	$6,000
2016	$18,000	$6,000
2017	$18,000	$6,000

Note: The nominal limits are for Elective Deferrals (401(k) and 403(b). The limits for 457(b)(2) and 457(c)(1) Limits have seen the same since 2002. Before 2002, the limits were slightly smaller ($ 8,500 in 2001; $8,000 in 2000, 1999 and 1998; $7,500 in 1997). Catch-up Deferrals are to 401(k), 403(b), 457(b), or SARSEP plans. Source: Carol V. Calhoun, Calhoun Law Group, P.C