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The Impact of State Income Tax Breaks for the Elderly on Savings and Income Security

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The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Retirement and Disability Consortium. The opinions and conclusions expressed are solely those of the author(s) and do not represent the opinions or policy of SSA or any agency of the Federal Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of this report. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation or favoring by the United States Government or any agency thereof.

I specially thank Michael Collins for great feedback, as well as Corina Mommaerts, Cliff Robb, and two anonymous referees for helpful comments and discussion.

I am also grateful to the Institute for Social Research, the University of Michigan for granting the access to the confidential HRS and Administrative data to conduct this research

Abstract

This first study provides the causal effects of the state retirement income exemption policies on saving for retirement and long-term impact on income in retirement, which have been under-studied. Using the Social Security W2 earnings records linked to restricted Health and Retirement Data (HRS) data, I find that a 26% decline in savings into retirement plan accounts in post-policy periods. Workers in states with exemption offers were also less likely to save compared to those worked in states without exemption. The fall in household income (both before and after-tax) in retirement further implies that seniors in exemption states were not better off than their counter-part states. Hence, states might consider rethinking the effectiveness of these policies.

Keywords: state retirement income tax exemption, savings for retirement, income in retirement, two-ways fixed effects, event study.

REF: H2, H3

I. Introduction

Economic security among older Americans has been shaped in a new landscape of a rapidly aging society with a longer life expectancy, declining Social Security replacement rates, a shift in employer-sponsored retirement plans from defined benefit to defined contribution plans, and increasingly high health care costs. However, three main sources of secured income have remained significantly important: social security, pension income, and earnings[1]. While the majority of the seniors have income from Social Security, lower-income individuals are more likely to rely substantially on this source of income. For example, in 2016, 78.51% of individuals in the lowest income quartile reported having income from Social Security, which accounted for 89.34% of their total income. In contrast, this share among the individuals in the highest income quartile was 87.51%, but it only made up of 30.39% of their total income, and these shares increase over time (see Table 1). However, income from retirement plans such as 401(k) or Individual Retirement Account (IRA) tends to fall over time regarding both percentage of having income from and its share per total income among lower income groups. Additionally, among those having retirement accounts, only about one third had positive account balance, but majority had balance below $50,000 (see Table 2).

[1] Earnings measure pay from work, self-employment, and assets and savings.

Table 1. Individual Income Distribution, among 65+

A. Percentage receiving income type

Income Quartiles	***Lowest***		***Second***		***Third***		***Highest***	
	1992	2016	1992	2016	1992	2016	1992	2016
Social Security	72.33	78.51	79.31	95.13	81.19	94.58	56.04	87.51
Earnings	12.58	2.23	31.97	3.96	40.92	11.96	77.29	33.56
Retirement Income	18.55	3.49	50.16	12.51	68.32	40.04	52.66	62.28
SSI/SSDI income	15.72	4.42	8.15	7.81	2.31	3.41	0.97	0.98
Other public assistance income	14.47	7.82	15.05	14.57	17.82	10.49	16.91	14.41
Mean personal income	**4,735**	**5,068**	**11,627**	**11,945**	**20,284**	**20,776**	**45,204**	**63,196**
N	*310*	*2,368*	*314*	*3,593*	*302*	*4,051*	*221*	*5,643*

B. Percentage of total income

Income Quartiles	***Lowest***		***Second***		***Third***		***Highest***	
	1992	2016	1992	2016	1992	2016	1992	2016
Social Security	64.21	89.34	49.70	87.05	32.53	71.83	10.56	30.39
Earnings	7.57	1.88	16.29	1.58	23.87	5.89	57.63	20.54
Retirement Income	9.91	2.29	22.60	3.86	35.01	13.49	26.59	28.63
SSI/SSDI income	15.06	2.64	5.67	3.96	0.94	1.86	0.19	0.34
Other public assistance income	3.17	2.24	5.57	1.75	7.11	2.22	4.78	4.93
Other income	0.07	1.61	0.158	1.81	0.544	4.717	0.259	15.166
Mean personal income	**4,735**	**5,068**	**11,627**	**11,945**	**20,284**	**20,776**	**45,204**	**63,196**
N	*310*	*2,368*	*314*	*3,593*	*302*	*4,051*	*221*	*5,643*

Note: Author's calculation based on the data comes from the HRS 1992 and 2016.

Table 2. Household Ownership of Private Retirement Accounts and Pension Plans, 1992-2016

	Positive account balance		Account balance >50K		Account balance >100K		Mean (SD) balance conditional on positive	
	1992	2016	1992	2016	1992	2016	1992	2016
A. Individual Retirement Account (IRA)								
40-50	42.77	36.99	8.31	23.02	4.15	12.92	17,121 {57,269}	47,743 {124,923}
51-60	45.51	35.21	12.17	21.92	4.80	16.94	21,424 {62,255}	74,342 {218,941}
61-69	47.91	45.27	12.81	34.15	4.21	28.34	19,747 {40,479}	146,439 {351,102}
70+	20.39	41.59	5.25	30.56	0.00	23.00	7,107 {15,299}	104,414 {286,378}
B. Defined Contribution (DC) Retirement Plans								
40-50	31.58	37.37	8.87	22.40	4.17	15.22	17,110 {61,128}	76,055 {238,455}
51-60	22.68	30.14	6.24	19.07	3.21	13.23	12,331 {64,075}	58,627 {204,716}
61-69	12.77	17.23	3.51	11.21	1.76	8.66	7,242 {49,103}	37,441 {153,874}
70+	9.08	3.06	0.00	1.60	0.00	11.62	2,535 {10,222}	9,944 {133,655}

Note: Author's calculation based on the data comes from the HRS 1992 and 2016.

It is clear that Social Security income has been an important income source, but providing for the replacement rate of only 35% of preretirement income for a typical household (Rhee & Boivie, 2015), leaving the income gap to be filled to two other sources of incomes: employer-sponsored retirement plans[2] and private savings. One significant policy question is which policy tool is more efficient in promoting saving for retirement, especially among low

[2] In this study, I use private employer sponsor retirement plans, retirement plans, and private pensions interchangeably.

income workers. Studies ranging over 40 years show that governments have been actively engaged in reform to boost private retirement saving with two specific aims: income adequacy assurance and poverty reduction in later life. Besides the retirement program's design, the tax subsidy feature (tax-deferral) of employment-based retirement plans is widely attractive and has a well-established impact on savings. While vast literature centers on the link between federal income tax treatments and savings for retirement, little research has been done exploring the role of state governments in adding further subsidies through offering exemptions and/or deductions for pension income, and how these policies impact saving behaviors and consequential income in retirement.

States have a long history providing personal income tax exemptions/deductions/credits for retirement income. State policies on retirement income exclusions vary substantially ranging from exempting all sources of retirement income to moderately deduct a small portion from state taxable income tax base. Still, they have one or both of two purposes: to secure the income of taxpayers who exit the labor force; and to serve as a means of attracting or retaining retirees in a state. Research on these state income tax reliefs to the seniors are limited, and most of them examined how the state income tax policies affected the overall effective tax rates facing the elderly taxpayers (Forman, 1995; Penner, 2000; Wheeler, 2000; and Edwards and Wallace, 2004) and the consequences of such tax preferences on state revenue and elderly migration across states (Conway and Rork 2008,2012,2014; Pan and Wagner (2011), Onder and Schlunk (2015) , Brewer et al.,2017).

The goal of this study is to fill the gap within this literature by addressing two particular questions: (1) Did the state retirement income tax exemption (SRITE) policies affect saving for retirement via their impact on contributions to retirement plan accounts? If so, under which

mechanism the policies impacted savings behaviors?; and (2) if the impact existed, would income in retirement have been changed? The first question-set addresses the direct effect of the exemption policies on saving for retirement. Unlike most of the recent studies examining the effects of tax incentives on retirement savings in a setting of federal or national policies, this first study looks at the state-level policies that additionally offer further tax incentives to retain income for the seniors. The second question in this study aims to disclose the long-term effects of the SRITE policies on the distribution of income in retirement. Many studies on the distributional effects of income tax provisions, including tax incentives for retirement, do not emphasize how the law changes affect wealth accumulation of individuals with different lifetime incomes and different future retirement incomes. This study, however, examines how the changes at state-level in income tax rules would affect the distribution of income (both before and after-tax) at retirement.

To answer these questions, I use the Social Security Administration (SSA) W2 earnings records and restricted geographic Health and Retirement Study (HRS) data files linked to RAND HRS data to examine the effects of SRITE exemptions on contributions to retirement plan accounts in preretirement period and income in later life. First, I show that the SRITE policies were associated with an average decline in unconditional contribution to retirement plan accounts by $606 (in real 2016 dollars) or 24% after the exemptions imposed, and by $731 (or 10%) contribution conditioning on positive. The dynamic treatment effect model shows that a downward trend in savings after the enactment of the SRITE policies, but this impact was not observed to be linear. Nevertheless, the results reveal the negative impact on average during the study period. The findings are consistently robust across different specifications and different samples. Additionally, the effects differed substantially across demographic groups, with larger

effects centered among individuals with higher educational attainment, and among male and married households. Interestingly, the estimation results reveal that both wages/earnings and taxable savings are observed to have fallen in states offer retirement income exemption, which suggest that the reduction in contributions in retirement plans induced by the SRITE policies caused individuals to work less rather than increasing their alternative savings vehicles. These observations imply that income effect dominated substitution effect; therefore, the state exemption policies created negative effects on savings.

The second set of results show that in the pooled sample, individual retirement income (income from private employment-based retirement plans) is estimated to decrease by $908 annually (or 11 percent), and among retirees who ever had a retirement plan in their working period, the findings suggest a larger effect (though the estimates are marginally statistically significant). When using the household sample, the estimates are relatively similar to those with the individual sample, but the estimates are statistically insignificant. The estimation results, when breaking down by sources of income, imply that both retirement income and social security benefits were not likely to be the driving forces of the decline in total household income among the seniors. Taken as a whole, findings suggest that while the SRITE policies did not lower level of retirement income in old age, they seemed to discourage working families either to save more into retirement accounts or to urge new participants into these plans as expected.

The paper proceeds as follows: In Section 2, I provide brief history of state pension income tax for the old adults. In Section 3 I describe a simple framework that allows us to expect the direction of the effects of state pension income tax exemptions, while in Section 4 I show data sources and empirical approaches in estimating the impact of state pension income

exemptions. Then, in Section 5 I report the main results and sensitivity analysis for the two set outcome variables before drawing conclusions in Section 6.

2. Institutional Background

In this section, I provide institutional background information about state pension income tax for the seniors. Three types of elderly income tax breaks have been offered at either federal or state levels: favorable treatment of pension income, preferential treatment of Social Security benefits (SSB), and an extra deduction, exemption, and/or credits based on age[3] (Conway & Rork, 2014) (See details in Appendix A) . Age-determined exemptions exist in the federal law and most states. These exemptions, however, tend to be modest in size and have been relatively stable over time (Brewer et al., 2017).

Social Security Benefits (SSB) were exempt from both the federal and state taxable income until the Social Security Amendment of 1983, when up to 50% of the SSBs were subjected to the federal income tax for single (married) households with a "combined income" greater than $25,000 ($32,000 for a couple). The Omnibus Budget Reconciliation Act of 1993 established additional income thresholds, above which up to 85% of SSB are taxable[4]. At the state level, the majority of states exclude SSBs from the state income taxation, ranging from exempting full amount of SSBs to a portion based on certain criteria (see Table 1). The exemptions of certain types of pension income are unique to the state income tax system, which has shown significant variation across states over time. They are also likely to be the largest potential benefit to taxpayers, and in some states, the highest income households get more benefits from such tax

[3] In this study, I focus only on the state tax treatment of pension income, especially pension income from employer-sponsored retirement plans, such as 401(k), rather than federal policy toward pension income or tax preferences based on age, such as income deductions for those who are 65 years old and older.
[4] Households above $34,000 for single filers and $44,000 for joint filers must pay up to 85% of their SSBs.

treatments. Table 1 reports the number of states that enact state income tax treatments of public pension and private retirement incomes.

As of 2014, and in regard to public pension income[5], 10 states exempt the full amount of public pension income from the state income tax base, while 18 states provide partial exemptions for public pension income by a fixed amount of pension income or by ages[6]. The remaining 14 states provide no exemption for public pension income.

State tax treatments of private retirement income (i.e., income distributed from an IRA and employer-sponsored retirement plans) tend to be less generous than that of public pension income. As of 2018, only four states (Hawaii, Illinois, Mississippi, and Pennsylvania) exclude the full amount of private retirement income from state taxable income. 28 states provide exemptions for a portion of retirement income, which is a relatively small amount but is higher for those who are 65 years and above or those with a disability. The exemption amounts and the types of eligible retirement plans differ substantially across states, and within states, the amounts exempted have changed overtime. For example, one of the most generous states (New Jersey) excludes $45,000/$60,000 if income is less than $100,000 for taxpayers 62 and above or those who are blind/disabled. A modest state (Montana) offers up to $4,180 for single filers whose (Adjusted Gross Income) AGI is less than $34,820[7]. The 20 remaining states do not have an exemption for private retirement income.

One of the justifications for these tax breaks is that seniors live on low (often fixed) incomes while they face increasing costs, especially healthcare and housing. Back in the 1970s

[5] Public pension income means income from federal, state, and local governments' retirement plans.

[6] Noted that Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming do not levy a personal income tax. New Hampshire and Tennessee collect income tax only on interest and dividend income. Therefore, any type of pension income is not taxed.

[7] For married-jointly filers, the amount is double.

and 1980s, when many states passed legislation offering retirement income tax breaks, poverty among seniors was substantially widespread, with approximately 25% during the 1970s and 16% in the1980s living in poverty (CRS, 2019). Therefore, state pension income tax breaks were useful in retaining a significant amount of income among the elderly.

3. Theoretical Framework

In this section, I present a simple theoretical framework motivated by the two-period life-cycle model to explain how tax subsidies affect retirement behaviors. Such analysis is conducted similarly to examine how an increase in the marginal rate of return to saving influences saving behaviors. Similar to the approach proposed by Bernheim (2002) and Friedman (2015), I start with a simple model in which each individual lives for two periods with two corresponding utility functions: $C_{i,1}$ and $C_{i,2}$ represent levels of consumption in the first period (working life) and in the second period (retirement), respectively. Suppose individuals work, earn income Y_1, and save in taxable saving accounts (S) and tax-favored saving accounts (P) (retirement saving accounts) that are excluded from the income tax base in the first period. Therefore, income in the second period – Y_2 – comes from S and P. For simplicity, suppose the rate of return for S and P are the same, and individuals have no initial wealth. The individual utility maximization, given the budget constraints, are described as follows:

First period $$C_1 = (1 - \tau_1)(Y_1 - P) - S_1$$

Second period $$C_2 = (1 - \tau_2)((1 + r)P + rS_1) + S_1$$

where r is the rate of return (assuming the same rate for both taxable and non-taxable saving accounts), τ_1 and τ_2 are marginal tax rates on personal income in period 1 and period 2, respectively, with $\tau_1 > \tau_2$, and $Y_2 = (1 + r)P + rS_1$. Following Friedman (2015), this assumes

that, under perfect certainty, investing in P is preferred to taxable saving vehicle S and that individuals cannot borrow to invest in P; hence, S is set to be zero.

Now that the government provide further exemptions (either age-specific exemptions or income-based exemptions) in period 28. The budget constraint equations become:

$$C_1 = (1-\tau_1)(Y_1 - P)$$

$$C_2 = (1-\tau_2)\big((1+r)P - E\big) + E$$

For each individual, choosing C_1 and C_2 so as to maximize her/his utility given the budget constraints is expressed as:

$$U = C_1 + \frac{1}{1+r}C_2 = (1-\tau_1)(Y_1 - P) + (1-\tau_2)P + \frac{\tau_2}{1+r}E \quad (1)$$

To maximize the utility with respect to P, the first-order condition is solved such that:

$$\frac{\partial U}{\partial P} = \frac{\partial C_1}{\partial P} + \frac{\partial C_2}{\partial P} = -(1-\tau_1)C_1 + (1-\tau_2)C_2 = 0 (2)$$

And the second-order condition is:

$$\frac{\partial^2 U}{\partial^2 P} = (1-\tau_1)^2 C_{11} + (1-\tau_2)^2 C_{22} - 2C_{12}(1-\tau_1)(1-\tau_2) < 0 \ (3)$$

Analyzing how the exemption affected individuals' saving behaviors is theoretically equivalent to looking at the first-order condition of P with respect to τ_1, τ_2, E, and Y_1:

$$\frac{\partial P}{\partial \tau_1} = \frac{-C_1 - (1-\tau_1)(Y_1-P)C_{11} + (1-\tau_2)(Y_1-P)C_{21}}{\partial^2 U/\partial^2 P} = \frac{-C_1}{\partial^2 U/\partial^2 P} - (Y_1 - P)\frac{(1-\tau_1)(Y_1-P)C_{11} - (1-\tau_2)(Y_1-P)C_{21}}{\partial^2 U/\partial^2 P}$$

(4)

$$\frac{\partial P}{\partial \tau_2} = \frac{C_2 + (1-\tau_2)\big((1+r)P-E\big)C_{22} - (1-\tau_1)\big((1+r)P-E\big)C_{12}}{\partial^2 U/\partial^2 P} = \frac{C_2}{\partial^2 U/\partial^2 P} + [(1+r)P - E]\frac{(1-\tau_2)C_{22} - (1-\tau_1)C_{12}}{\partial^2 U/\partial^2 P}$$

(5)

[8] In practice, individuals also receive public pension and social Security benefits in period 2. However, in this paper, since the focus is exploring how tax incentives affect private retirement savings, these parameters are not taken into account for the simplicity of the model.

(4) and (5) show the tax effects on retirement savings, in which the first term shows substitution effects and the later expresses income effect:

$\frac{\partial P}{\partial E} = \frac{(1-\tau_1)\tau_2 C_{12} - (1-\tau_2)\tau_2 C_{22}}{\partial^2 U/\partial^2 P}$ (6)

$\frac{\partial P}{\partial Y_1} = \frac{(1-\tau_1)^2 C_{11} - (1-\tau_1)(1-\tau_2) C_{21}}{\partial^2 U/\partial^2 P}$ (7)

By assuming C_1 and C_2 are normal goods, $\tau_1 > \tau_2$, and τ_1 and τ_2 are perfectly predetermined, implying that $\frac{\partial P}{\partial Y_1} > 0$ (Y_1 has a positive effect on P) and $\frac{\partial P}{\partial E} < 0$ (an introduction of E increases after-tax income in the second period, which causes consumption in both periods to increase, and, therefore, P falls).

However, it is noted that τ_1 and τ_2 are indeed not perfectly exogenous to the extent that taxpayers might react to higher marginal tax rates when Y_1 increases. In this case, marginal tax rates are determined as:

$\tau_1 = \tau_1(Y_1 - P)$ and $\tau_2 = \tau_2((1+r)P - E)$

Then (6) and (7) become:

$\frac{dP}{dE} = \frac{\partial P}{\partial E} + \frac{\partial P}{\partial \tau_2} x \frac{\partial \tau_2}{\partial E}$ (8); $\frac{dP}{dY_1} = \frac{\partial P}{\partial Y_1} + \frac{\partial P}{\partial \tau_1} x \frac{\partial \tau_1}{\partial Y_1}$ (9)

Since $\frac{\partial \tau_2}{\partial E} < 0$ and $\frac{\partial P}{\partial E} < 0$, the impact of E on P depends on the sign of $\frac{\partial P}{\partial \tau_2}$. If $\frac{\partial P}{\partial \tau_2} < 0$, then $\frac{dP}{dE} < 0$. $\frac{\partial P}{\partial \tau_2} > 0$, $\frac{dP}{dE}$ could be positive or negative. From (5), it shows the impact of τ_2 on P is ambiguous, depending on which effect (substitution effect or income effect) is larger. Similarly, the impact of Y_1 on P depends on the sign of $\frac{\partial P}{\partial \tau_1}$.

The above analysis of a simple model that explains the impact of a retirement income exemption on savings for retirement suggests that an exemption policy might have a negative

impact on retirement savings, while income would have a positive impact, providing that marginal tax rates are exogenously predetermined.

4. Data and Empirical Strategy

4.1. Data

Sample of Analysis.

This study compiles multiple data sources to create the two analytic samples. The first is the RAND Health and Retirement Study (RAND HRS) longitudinal data derived from all waves of the HRS data from 1992 to 2016. The second are restricted files from the HRS data, including state identifier file and the W-2 earnings records for HRS respondents. The third is the RAND HRS Tax Calculation for Respondents to the HRS 2000-2014 surveys.

The Health and Retirement Study (HRS) data is a biennial national longitudinal study of health, retirement, and aging households with at least one respondent above the age of 50. Younger respondents may be surveyed if their spouse is above the age of 50. The HRS surveys a representative sample of approximately 20,000 people in the United States, supported by the National Institute on Aging and the Social Security Administration (SSA), and collects comprehensive information on income, asset, employment, retirement and pension plans, and retirement and Social Security benefits.

The first analytic sample uses the HRS data matched to SSA data on benefits and earnings. The earnings records are derived from IRS W-2 records submitted by employers on behalf of their employees. These records provide data on annual tax-deferred contributions[9][10] (or elective deferrals) by employees to retirement plan accounts. The unit of observation in the SSA data is

[9] This information is derived from W2 Box 12, which sums up elective deferrals plans including 401(k), 403(b),
[10] (b), and others. More details can be seen at https://www.irs.gov/pub/irs-pdf/fw2.pdf

record-employer-year, meaning one HRS respondent could have a multiple W2 forms corresponding to her/his multiple jobs. Therefore, the matched wages and elective deferrals are the sum amounts for each HRS respondent-year level. Note that the SSA have several rules for top coding[11], but a code of zero represents the true zero-dollar value. For 10 waves of the HRS data, 22,336 HRS respondents consented to releasing earnings records between 1978-2016. The matched HRS-SSA data resulted in roughly 120,000 observations between 1991-2016 in the analytic sample. While the SSA data have provided earnings records annually since 1978, the HRS data are biennial in even years. To create the analytic sample with annual observations, I incorporated information available in every even year to create personal information for odd years. Finally, it is merged with the state identifier files to obtain information on state of residence for each HRS respondent. This sample was used to estimate the effects of the state retirement income tax break on saving for retirement outcomes, which excludes individuals who were 70 years old and older and those under 30 years old.

The second analytic sample is constructed from three data sources: the RAND HRS data spanning 1992-2016, RAND HRS Tax Calculations (2000-2014), and the state identifiers file from the restricted HRS data. This sample was drawn to estimate the effects of state exemption policies on income in retirement and, therefore, provide an observation in the sample of individuals who reported to retire or partially retire and those aged 65 and above. Individuals with disability are excluded. Because the information on total income (both before and after tax) is not available at individual level, I measured income in retirement at both the individual and household level. Finally, I excluded observations of the top 1% of the income in all sources.

[11] For example, wages were top coded at $250,000, any value in between 1 and 49 was coded as missing value, or an absolute value ending in 01 to 49 was rounded down.

I augmented several data sources from the U.S. Census Bureau to obtain state characteristics, including: the state share of the 65 years and over population from the Population and Housing Unit Estimates; state median income; state housing price index (from Federal Housing Finance Agency (FHFA) House Price Index); and state unemployment rate (from Local Area Unemployment Statistics - U.S. Bureau of Labor Statistics). Finally, all monetary values are deflated in 2016 dollars.

Table 3 presents statistics for the three samples: exemption states, no income tax states, and no exemption states (comparison states). Across all the variables measuring contributions into retirement plans and income in retirement, it is apparent that states with no exemption policies experienced relatively higher values than exemption states and states with no income tax. For example, in the sample of no exemption states, working individuals contributed on average $2,947 to retirement plan accounts. In states that offered any source of retirement income exemption, workers saved roughly $2,728 to their retirement accounts, and those who worked in states with no state income tax saved as little as $2,347. Meanwhile workers in states with exemption policies earned less than those were in comparison states approximately $2,000 on average. Across three samples, most of the interviewees in the HRS data are white, with about half of them having at least some college education. About two-thirds of respondents lived in coupled households with an average household income of $70,000.

Table 3. Summary Statistics.

	RI Exemption states		No Income Tax States		No RI Exemption States	
	Mean	SD	Mean	SD	Mean	SD
Contributions to Retirement Plans						
Elective Deferrals/Retirement Plan Contribution	2,728	5,911	2,347	5,623	2,947	6,016
Positive Elective Deferrals	7,353	7,757	7,082	7,867	8,226	7,589
401(k) Contribution	1,166	3,957	1,042	3,940	1,322	4,373
Positive 401(k) Contribution	6,746	7,277	6,777	7,880	8,093	7,890
Taxable Wages	40,574	40,549	39,375	42,098	42,555	43,207
N	46,976		21,851		33,353	
Income in Retirement						
Pension Income	7,868	26,310	7,230	37,117	8,482	27,846
Earnings	7,950	30,985	7,375	33,046	8,222	32,034
Social Security Income	9,663	8,230	10,002	7,909	10,026	8,128
SSDI/SSI Income	1,038	4,254	811	3,492	680	3,287
Other Government Transfer	1,034	5,438	1,309	7,069	1,080	6,772
Household Income	64,427	108,764	65,270	113,904	74,395	166,686
N	56,613		27,993		39,458	
Demographics (HRS Pooled Sample)						
Age	65	10.02	66	10.25	66	10.37
Race (%)						
White	81.1		87.73		87.11	
Black	14.18		6.79		6.07	
Others	4.72		5.48		6.82	
Educational Attainment (%)						
Less than high school	16.78		20.94		16.6	

High-school graduate	36.22		30.44		33.18	
Some College	22.97		23.99		24.44	
College and Above	24.03		24.63		25.78	
Household Couple (%)	65.17		66.99		67.28	
Number of children	2.91	1.99	3.04	2.05	2.96	2
Number of household members	2.22	1.15	2.27	1.22	2.28	1.23

Note: Data comes from the SSA W2 (1991-2016) and RAND HRS (1992-2016), and the Geographic Files from the restricted HRS data

Outcome Variables

I estimated the effects of the SRITE policies on various outcome variables falling into two groups: (1) saving for retirement and (2) income in retirement.

The first set of outcome variables measured behavioral responses to the policies including retirement contribution levels and contribution share. The annual contribution level (elective deferrals) is derived from the annual deferred wages (box 12 of W2 form), measured by flows into retirement plan accounts is observed in both unconditional and conditional on positive levels. I also observe the contribution as a fraction of gross wages. Since there were a large number of observations with zero contribution, I also constructed other outcome variables to measure the likelihood to save in retirement plans, defined as an indicator for having any positive contribution in a specific year.

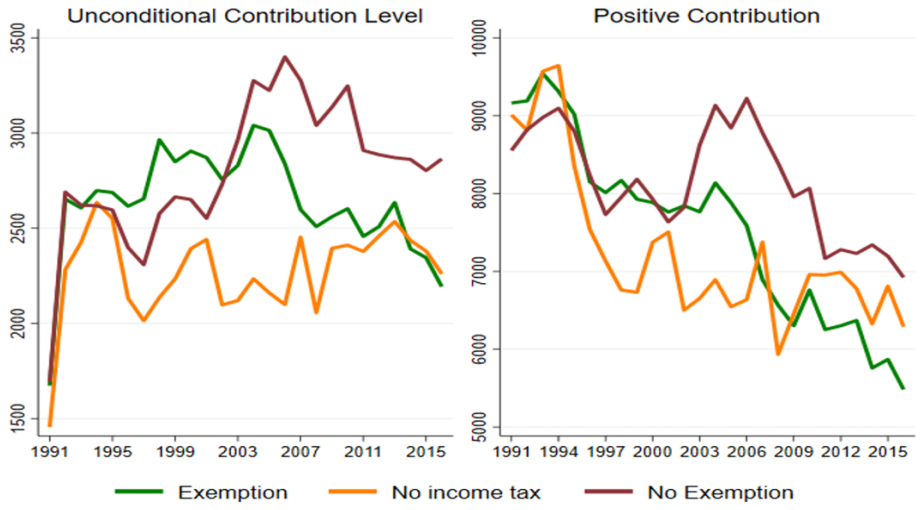
The second group of outcome variables measures annual income in retirement. First, I estimate the total before and after-tax household income[12]. Then, I break down the household income into five key income sources, including retirement income (i.e., income from employer-sponsored retirement plans and annuities from retirement accounts), Social Security benefits,

[12] Total before-tax household income is the sum of Respondent's and Spouse's income from earnings, pensions and annuities, Social Security benefits (retirement, SSI, and/or SSDI), unemployment and workers compensation, other government transfers, household capital income, and other income. (RAND,2018)

Social Security Disability Income and/or Social Security Supplement Income (SSDI/SSI), income from other government transfer, and capital income. These five income sources are measured using both the individual and the household samples described above, while total income is observed at the household level only.

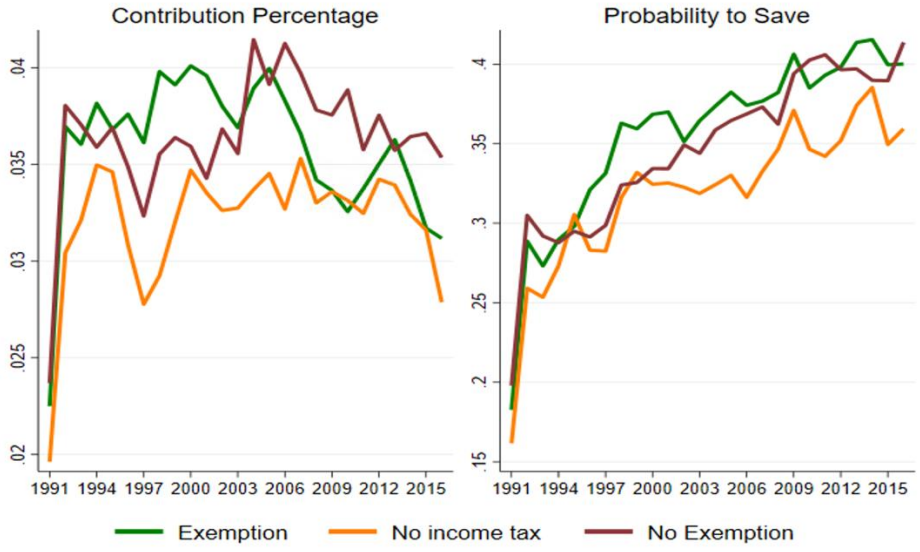
Figures 2-4 plot overtime trends in key outcome variables. Three key findings from these figures. Several highlights from these figures are noticeable. First, states offered the SRITE policies experienced lower contributions (both unconditional and conditional on positive) levels than states do not provide any exemption. Further, contribution levels in SRITE states declined persistently over time, especially the positive contributions (see Figure 2a). Second, the gap in contributions between exemption and no exemption states become more extensive in 2001 afterward. Third, contribution share (contribution percentage) in states with SRITE policies shows a downward trend and experienced smaller ratios than that in states without SRITE policies since 2004, although workers in SRITE states were more likely to save in retirement plans (Figure 2b).Finally, regarding retirement income and total household income (before and after-tax) in retirement, as seen in Figures 4a and 4b, they show a consistent pattern that lower retirement income and total household income are observed in SRITE states, and the gaps became wider. These observations suggest that the SRITE policies might not encourage workers to save more in retirement accounts. Consequently, income in retirement would have been declined in states with SRITE policies.

Figure 2a. Average Annual Elective Deferrals/Contributions: 1991 2016



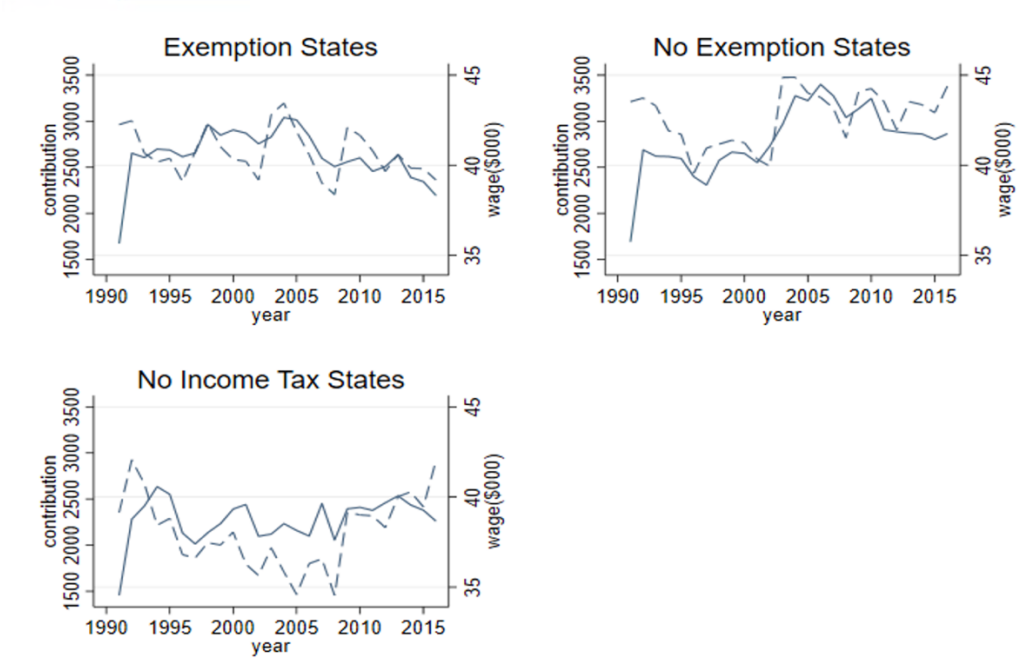
Notes: Data comes from the SSA W2 records linked to RAND HRS data files and geographic HRS data file from 1991 to 2016. Unconditional Contribution level is the annual total elective deferrals. Positive Contribution is measured among those who had positive elective deferral amount in each year. Green line "Exemption" presents mean value for states with exemption policies. Orange line "No income tax" shows mean value for states without no income tax. And Maroon line "No Exemption" displays the mean value for states without exemption policies (comparison states). All monetary values are deflated in 2016 dollars. All figures are used sample weights.

Figure 2b. Elective Deferral Percentage vs. Probability to Save, 1991 – 2016



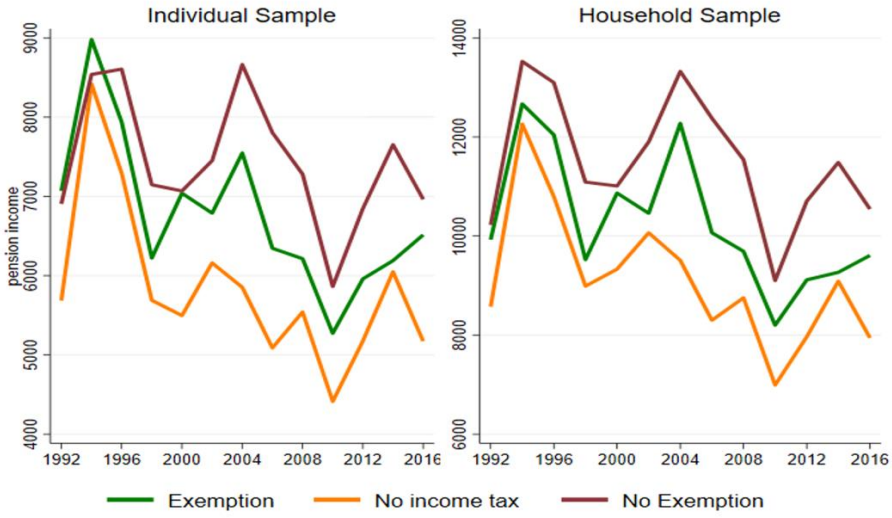
Notes: Data comes from the SSA W2 records linked to RAND HRS data files and geographic HRS data file from 1991 to 2016. Contribution percentage is measured as annual deferred wages divided by gross wages. Probability to Save is an indicator for having any positive contribution in each year. Green line "Exemption" presents mean value for states with exemption policies. Orange line "No income tax" shows mean value for states without no income tax. And Maroon line "No Exemption" displays the mean value for states without exemption policies (comparison states). All monetary values are deflated in 2016 dollars. All figures are used sample weights.

Figure 3. Average Elective Deferrals vs. Taxable Wages, 1991-2016



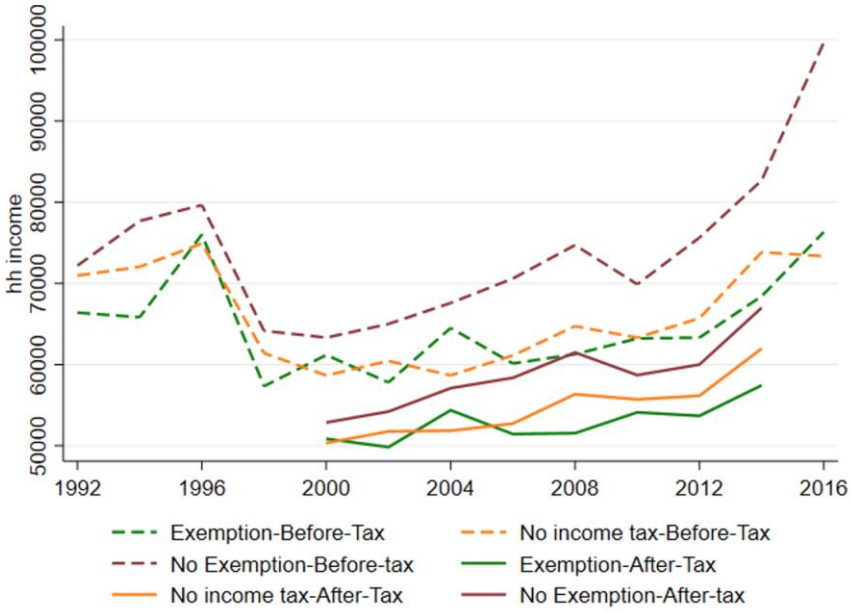
Note: Data come from the SSA W2 records from 1991 to 2016 linked to geographic HRS data file. The solid blue lines illustrate elective deferral (deferred wages into retirement plan accounts), and the dash blue lines show taxable wages among states with different policies toward retirement income. All monetary values are deflated in 2016 dollars. All figures are used sample weights

Figure 4a. Average Individual Retirement Income and Household Pension Income, 1992-2016



Notes: Data comes from RAND HRS 1992-2019. Retirement income is income from all employer-sponsored retirement plans and annuities from retirement plans .Total household's retirement income is equal to sum of respondent and spouse's retirement income. Values are deflated in 2016 and used sample weights. Green line presents average annual retirement income among states with SRITE policies, orange line shows average annual retirement income among states with no income tax, and red line displays average annual retirement income among states with no exemption policy.

Figure 4b. Average Annual Household Income, 1992-2016



Notes: Data comes from RAND HRS 1992-2019, and from 2002 to 2014 for After-tax income variable linked to restricted HRS data files. After-tax income is equal to total household income minus federal tax liability, state tax liability. Values are deflated

in 2016 dollars and used sample weights. Green lines present average annual household income among states with SRITE policies, orange lines show average annual household income among states with no income tax, and red lines display average annual household income among states with no exemption policy.

4.2. Empirical Methods

Estimating the effects of the SRITE policies on contribution into retirement plan accounts.

I employed a two-way fixed effect estimation to exploit changes in outcome variables across states over the time period of 1991 and 2016. I defined treatment as states with any type of retirement income exemption policy (states with blue and green ink in Figure 1), while control states are those listed in Appendix A (states without private pension – last column).

For each outcome variable, I estimated the effect of state tax treatments of pension incomes as shown below:

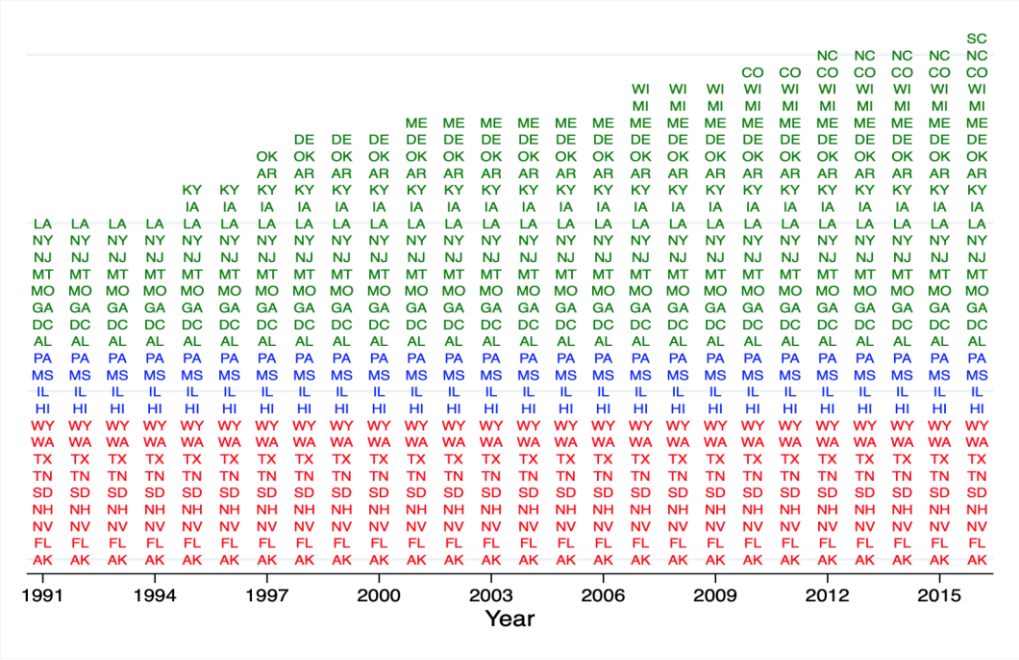
$$y_{ist} = \alpha + \beta D.RIExempt_{ist} + \gamma X_i' + \theta\tau_t + \epsilon\vartheta_s + \varepsilon_i, \quad (10)$$

where i indexes individual, s indexes states, and t indexes time; y_{ist} are outcome metrics (employer-based retirement plan contributions, contribution share, and the probability to save); $D.RIExempt_{ist}$ is a treatment variable indicating 1 if an individual resided in a state that enacted any type of retirement income exemption in year t; X is a vector of control variables containing a full set of demographics (age, gender, race, marital status, education level, and household income), and employment characteristics (indicators for occupation, job tenure, and employer's contribution to DC plans)[13], and state characteristics (median income, housing index, unemployment rate, and share of over 65 year old population); and τ_t and ϑ_s are year dummies and state fixed effects to capture the effects of changes in national and state conditions that may affect outcome variables. For example, on top of the exemptions, a few states offer further

[13] Other factors could affect saving behaviors, such as marginal tax rates or contribution limits. However, such effects on contributions to retirement saving are relatively small (Lavecchia, 2018; Milligan, 2003; Rutledge et al., 2016).

exemptions for certain types of income sources.[14] Standard errors are clustered by state - year level to allow for correlated errors by states over time[15]. States with no income tax are excluded[16].

Figure 1. State Retirement Income Exemption Policy Timing



Note: "Red-ink" states do not impose state income tax. "Blue-ink" states provide full exemption of retirement income out of state income tax base. "Green-ink" states offer partial exemption of retirement income.

Source: Author's Summary based on State Legislation Website

The coefficients of interest β provide evidence of the impact of the state retirement income exclusion. However, β should be interpreted with caution, since it only tells the average treatment effects among treated states that vary in terms of treatment status during the study period.

[14] For example, Michigan exempts $11,495 (for single filers) and $22,991 (for joint filers) in interest, dividends, and capital gains income for seniors aged 73 and above. Virginia offers $12,000 of income from any sources for taxpayers 80 and older (Mcnichol, 2019)

[15] The bootstrapped standard error procedures are also conducted, confirming the similar standard errors as ones with clustering. Results are presented upon request.

[16] As a robustness check, when adding no income tax states, the coefficient estimates do not change much. Results are also discussed in the Robustness Check section.

One would be concerned that migration across states among seniors could contaminate the average treatment effects, such as those who once lived in control states and then moved to states with exemption policies to earn the benefits. In such cases, migration should be regarded as one outcome variable rather than an element affecting treatment status for each individual in the sample. The concern about moving across states (especially from a state without an exemption policy to states provided exemption policies) is that it might cause the treatment status to become endogenous. In this study, I show that it is not a big issue in several ways. First, previous studies show that migration among the seniors was a rare event; less than 1% of the 65 and over population move in any given year, and the pattern of movement has been stable over years (Conway, 2017; Molly & Smith, 2019). Therefore, the effects (if any) of the retirement income exemptions would be expected to be modest or even have no effect (Afons, 2008; Conway & Houtenville, 1998; Klemens, 2020; Klemens et.al., 2020; Onder & Schlunk, 2015[17]; Young et. al., 2016). Second, data from the ACS from 2000 to 2018 includes individuals from 18 to 70 years old. I showed here that the share of the general population who moved across states is small (at 2.44%, which is relatively close to the estimate of 2.9% in Young et.al (2016)). The proportion among seniors aged from 62 to 70 years old is even smaller on average (1.25%), and rather stable over years. Third, I ran the baseline model in which the outcome is the binary variable that indicates whether a person moved among the pooled sample of working individuals and among seniors who are aged from 62 to 70 years old. The estimates suggest that the likelihood of moving to states with exemption policies increased by 0.7 percentage points for the working sample and 0.4 percentage points for the senior sample, both of which are statistically significant, though the magnitude of the effect is rather small. Finally, as discussed in the

[17] Onder and Schlunk (2015) only find mixed effects of pension exemptions on interstate migration among 85 and older sub-groups.

robustness check section, I re-estimated the baseline model and showed that, when excluding those who moved across states,[18] findings are statistically similar. Instead, the coefficients become larger (see Figure 7). When further looking at savings behaviors among those who moved into states with an exemption (here I excluded movers into states without income tax), I estimated a fixed effect model to examine the effect of the SRITE polices among these movers. The results showed an increase by $1,844 after they moved into treated states. However, the estimate is statistically insignificant. Perhaps the standard errors are too large to see any effect (see the Appendix C). This might suggest that those who moved to states with an exemption policy did not change their behaviors toward saving for retirement, or at least the argument that the exemption policies would have not encouraged workers to save more (as the general findings) also held true. These findings, taken together, suggest that interstate migration would not have been affected by the exemption policies.

To further explore how the effects of the retirement income exemption differs across states, I also estimated another specification, in which I separate the treatment into two groups: (1) states that offer the full amount of retirement income; and (2) states that provide an exemption for a part of retirement income. As such, for each outcome variable, I ran the following regression model:

$$y_{ist} = \alpha + \beta_1 D.FullExempt_{ist} + \beta_2 D.PartExempt_{ist} + \gamma X_i' + \theta\tau_t + \epsilon\vartheta_s + \varepsilon_i, \quad (11)$$

where $D.FullExempt_{ist}$ and $D.PartExempt_{ist}$ are indicators for a person who resided in a state that offered full exemption of retirement income (states in red in Figure 1) and an indicator

[18] The HRS data do not provide a clear question about moving across states ("Do you/Are you still have the same residence/still living, all or part of the year, in that same residence in 1st R Previous Wave City?"). Instead, I construct an indicator that indicates a person who moved across states if her/his state of residence was different between two consecutive survey years. Out of 80,020 observations, 5,112 (or 6%) showed different states of residence between two consecutive survey years.

for being in states that exempt a portion of retirement income or exempt based on the age profile of the retirees (states in green in Figure 1), respectively.

As noted, state retirement income exemption policies substantially vary across states, from offering the exemption for the full amount of retirement income regardless of age profile or amount in retirement accounts (such as Illinois, Pennsylvania, Hawaii, and Mississippi) to modest exemption (such as Montana, North Carolina, and New Jersey). Additionally, the timing of exemption policies is not the same among states. Therefore, estimates as shown in Equation (10) are difficult to present in a useful way to interpret the average treatment effects (Abraham & Sun, 2020; Athey & Imbens, 2018; Callaway & Sant'Anna, 2018; de Chaisemartin & D'Haultfœuille, 2018; Goodman-Bacon, 2018; Wooldridge, 2005).

As such, I conducted a panel event study to estimate the impact of the state retirement income tax exemptions with two goals: (1) to test whether the pre-trend exists between the treated states and comparison states; and (2) to explore the dynamic treatment effects of the policy. As such, I estimated the following equation:

$$y_{ist} = \alpha_{is} + \tau_{it} + \sum_{k=-k}^{k+} \beta_k \, DRIExempt_{ist}^{k} + X_{ist} + \varepsilon_{ist} \quad (12)$$

where y_{ist} are outcome variables including contribution to retirement plans and income in retirement; α_{is} *and* τ_{it} are unit and time effects; X_{ist} is a vector of control variables that vary over time as those defined in Equation (10); and β_k is the parameter of interest shown in the treatment effect over time. I define [-k; k+] as the window observation for the dependent variables, in which -k are years prior to the event happening (i.e the year state implemented exemption policy) and k+ are years after the event. Therefore, β_k illustrates the dynamics of the treatment effects over the window [-k; k+].

Estimate the effects of the SRITE policies on income in retirement

I measured income in retirement with several outcome variables, including individual retirement income, social security income, SSDI/SSI benefits, and other government transfer values. Since total income is not available at the individual level, I measured total income (before and after tax) at the household level using the same data set as described above. Similar to Equation (10), for each outcome variable, I ran the following the two-way fixed effects regression:

$$y_{ist} = \alpha + \beta D.RIExempt_{ist} + \gamma X_i' + \theta\tau_t + \epsilon\vartheta_s + \varepsilon_i, \quad (13)$$

where all covariates are similar to those in Equation (10), except for the set of control variables for estimates using the household level as the unit of analysis. For these estimates, I used personal characteristics of household heads as a proxy for household characteristics, including age, education, race, and coupled household, as well as used information on both the respondent and spouse to build on household characteristics (age, race, gender, education, number of members in household), including health conditions, retirement plans, occupation characteristics in pre-retirement periods, and housing values.

The two-way fixed effect model as the generalized form of the difference-in-difference (DID) approach rests on the assumption of pre-policy parallel trends in outcome variables between the treatment and control groups. Unlike the conventional DID model, in which the treatment period is a one-time intervention, the two-way fixed effect model relaxes the timing of the treatment in such a way that it allows the treatment to vary overtime. Therefore, I validated the pre-trend assumption in two ways: (1) I conducted a visual inspection of the over-time trends in outcome variables to explore if they are plausibly comparable between states that offer exemptions and states that do not; and (2) I conducted event studies that allow for exploring the dynamics of treatment effects before and after the treatment took place.

Figure 2-4 separately presents the trends in key outcome variables of interest for three groups: exemptions states, no income tax states, and no exemption states (control states). Most of the outcomes show relatively comparable trends over time, especially between exemption and no exemption states. Additionally, Figure 5 shows the coefficient estimates (β_k in Equation (11) of the key outcome variable – annual contribution to retirement plans[19] – for each year before and after the year that states enacted their exemption toward retirement income. The insignificant coefficients in the pre-policy implies that there was no statistically significant difference between treated states (states with exemption policies) and control states (states with no exemption policies)[20], meaning that the DID consumption is satisfied, and, therefore, the estimates of β_k are unbiased.

5. Results

5.1. Effects on Contribution to Retirement Saving Accounts

Main Results.

Table 4 reports the average treatment effect for the main specification (or β in Equation (10)) for the pooled sample. Columns 1-4 of Table 4 show the coefficient estimates for different outcome variables: (1) unconditional contribution (both level and contribution share), and (2) conditional contribution (the likelihood to contribute and contribution level conditioning on positive).

[19] Other outcome variables are not reported but available upon request.
[20] Noted that for the longer pre-policy periods (i.e 8 years prior to the policy), the pre-trend seems not to be met for the contributions level.

Table 4. Contributions to Retirement Plans Estimation Results – Main Specification

	(1)	(2)	(3)	(4)
	Unconditional Contribution		Positive Contribution	
	Level	Share	Prob. (Contribution >0)	Positive Contribution
RIExempt*Post	-606.2**	-0.0099***	-0.0458**	-730.7***
	{106.3}	{0.0022}	{0.0104}	{218.1}
Pre-Policy Mean	*2,542*	*0.04*	*0.348*	*7,297*
Year fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes	Yes
Adj R-squared	0.217	0.113	0.179	0.353
N	80,329	80,329	80,329	25,565

Notes: Data comes from the W2 SSA Administrative data linked to RAND HRS spanning 1991 to 2016 and restricted HRS data files. States with no state income tax are excluded. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimates present results from separated regression with control variables. Control variables include indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household income terciles; indicators for occupation; and the employers' contribution to employee retirement plans; state unemployment rate, state median income; share of over 65 year old population; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

As expected, the effect of the SRITE policies on real contribution level appears to be consistently negative across the four outcome variables. As it can be seen in Columns 1 and 2, the state retirement income exemption policy is estimated to have unconditionally reduced annual contributions by $606 (or 24%)[21] in years following the exemption compared to those in states without exemption policies. Similarly, the real contribution share fell by 0.99 percentage points (or 27%) on average, meaning that a $1 increase in gross wages would have led to a 1 cent

[21] The estimates for contribution level top-coded by the annual contribution limits provide the similar results, with the coefficients are slightly smaller, but robustly statistically significant. The results are summarized in the Robustness Check section

drop in contributions. In addition, because there was non-trivial number of observations (about 70%) with zero value of contribution[22], I separated the SRITE effect on contribution to retirement saving accounts at the intensive margin from the effect at the extensive margin. To do so, I re-estimated the Equation (10) with the dependent variable as indicator for contributing any amount– I(Pr.(contribution)>0). Estimation results displayed in the Columns 3 and 4 suggest consistent findings that incidence of the exemption policies caused workers to have saved less in their retirement plans.

When looking at the 401k contribution separately,[23] the estimation results displayed in Table 5 paint a similar picture as there is strong evidence of the negative impact on 401(k) contributions, with a smaller reduction of $272 (or 16%) in unconditional contributions (in real 2016 dollars). Similarly, as a fraction of gross wages, the contribution share is estimated to fall by 0.41 percentage points (or 17%), though the estimate is statistically insignificant. Regarding conditional contribution estimates, I observed a reduction by 9% in likelihood to save.

Table 5. 401(k) Plan Contribution Estimation Results

	(1)	(2)	(3)	(4)

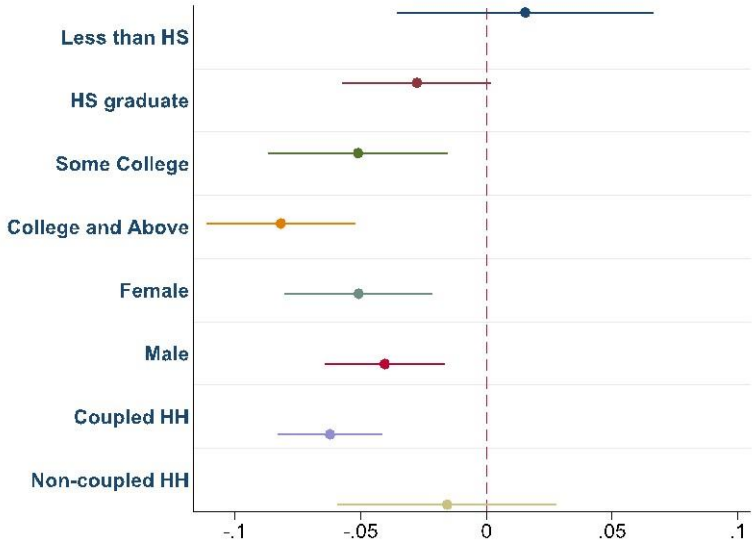
[22] This is because workers either were not offered a retirement plan by their employers or they actually had one but chose not to participate into the plan.
[23] Noted that the information for 401(k) contribution is only available since 2004 in the SSA Administrative W2 data records.

	Unconditional Contribution (401k)		Positive Contribution (401k)	
	Level	Share	Prob. (Contribution >0)	Positive Contribution
RIExempt*Post	-271.6**	-0.0041	-0.026**	-233.6
	{133.5}	{0.0026}	{0.014}	{320.1}
Pre-Policy Mean	*1,678*	*0.024*	*0.281*	*5,969*
Year fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes	Yes
Adj R-squared	0.186	0.112	0.14	0.427
N	36,919	36,919	36,919	9,435

Notes: Data comes from the W2 SSA Administrative data linked to RAND HRS spanning 2004 to 2016 and restricted HRS data files. States with no state income tax are excluded. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimate presents results from separated regression with control variables. Control variables include indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household income terciles; indicators for occupation; and the employers' contribution to employee retirement plans; state unemployment rate, state median income; share of over 65 year old population; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level

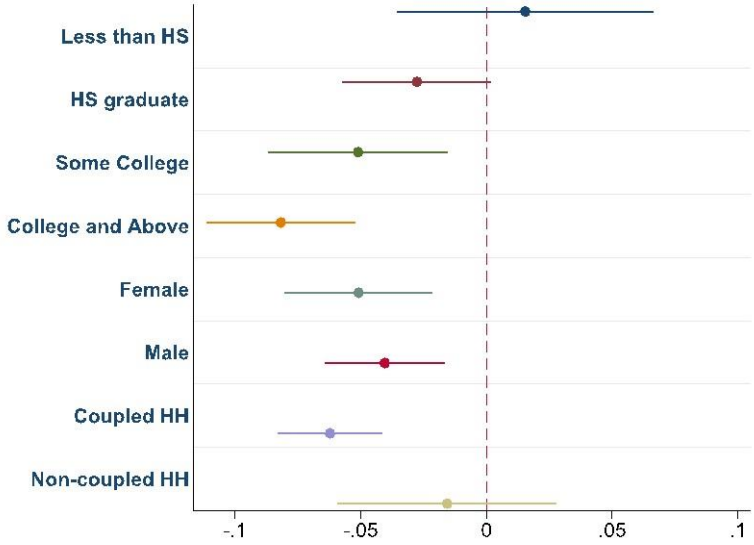
To examine how the state exemption policy impact differed across several demographic sub-population groups, I re-estimated the two-way fixed effect model (as in Equation (10) when the sample is separated by education attainment, gender, coupled household, and wage levels. Figure 6a, b, and c summarize the coefficient estimates (of three main outcome variables: unconditional contribution, contribution conditioning on positive, and probability to save) when the sample is split according to education levels: no high-school degree; high-school graduate; some college; and college and above.

Figure 6a. Estimation Results - by Subgroups: Contribution Levels



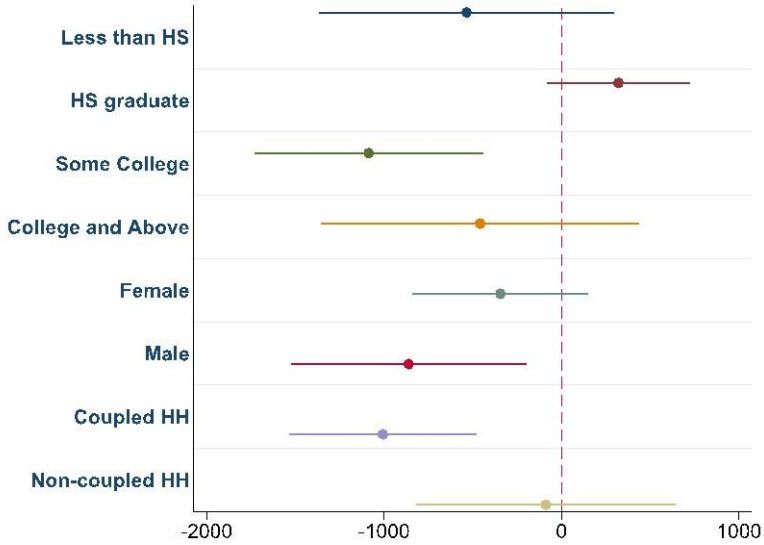
Notes: Each point and its associated line represent coefficient estimate and its 95 % confident interval of the key dependent variable (RIExempt*Post) for each subgroup. Each point estimate comes from separated regression. The control variables slightly vary across models, but are mainly included indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household income terciles; indicators for occupation; and the employers' contribution to employee retirement plans; state unemployment rate, state median income; share of over 65 year old population; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

Figure 6b. Estimation Results – By Subgroups: Probability to Save



Notes: Each point and its associated line represent coefficient estimate and its 95 % confident interval of the key dependent variable (RIexempt*Post) for each subgroup. Each point estimate comes from separated regression. The control variables slightly vary across models, but are mainly included indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household income terciles; indicators for occupation; and the employers' contribution to employee retirement plans; state unemployment rate, state median income; share of over 65 year old population; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

Figure 6c. Estimation Results – By Subgroups: Positive Contribution



Notes: Each point and its associated line represent coefficient estimate and its 95 % confident interval of the key dependent variable (RIexempt*Post) for each subgroup. Each point estimate comes from separated regression. The control variables slightly vary across models, but are mainly included indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household income terciles; indicators for occupation; and the employers' contribution to employee retirement plans; state unemployment rate, state median income; share of over 65 year old population; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

The differences across educational attainment levels are plausible, and the observation that higher educated individuals (those with some college and above) were likely to be more responsive is consistent with the recent retirement saving literature.[24] For example, among workers with college or an advanced degree, it was estimated that the SRITE policies were associated with a reduction of $890 in contributions. Further, it was estimated that they would have been less likely to save in retirement accounts. Workers without a degree were observed with a similar trend, with smaller effects (though the estimates for this subgroup are statistically insignificant). These results support the view that less sophisticated savers were less active in response to the policies.

[24] Recent studies examining heterogeneity of the effect of tax subsidies on saving for retirement show that more educated individuals are more likely to be active savers, meaning that they are more responsive to the change in policies affected saving (Chetty et al.(2014b), Ramnath (2013),Chernozhukov and Hansen (2004), Berheim (2003),
Engen and Gale (2000))

Other pronounced differences are also evident when I broke down the results by gender and marital status. The estimation results show that male and married household were observed to have reduced their contributions after the tax breaks implemented in states. For instance, among those with a positive contribution, male workers were estimated to have reduced contribution by $862 (or 11%) while such estimates for female workers was substantially smaller (a 6% reduction) and statistically insignificant. The sizable effect is also observed among married households, with a decline of roughly $1,000 (or 14%) in saving into retirement plans.

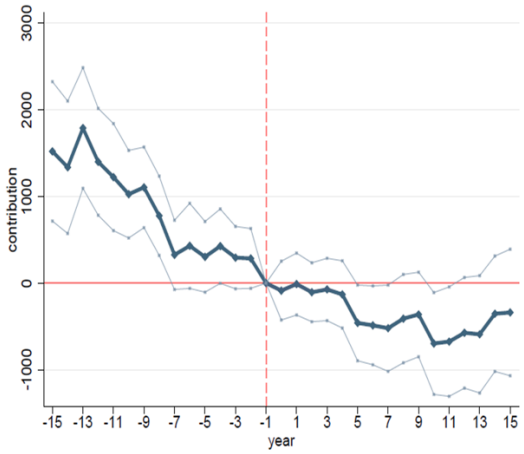
Dynamic Treatment Effects

In this section, I present the estimation results using the panel event study design to examine how the state retirement income tax exemption differed over time since their adaption. As noted, the event study design is employed with two distinct purposes: (1) accessing the pre-trend assumption in the DID approach; and (2) examining the dynamic treatment effects that take into account the effects of such tax incentives among states that implemented the policy prior to the study period (1991-2016). For instance, New Jersey and New York enacted their exemption policies in 1984 and 1982 respectively; or states that offer exemption of all retirement income (full exemption policy) like Illinois has had the policy since 1983.

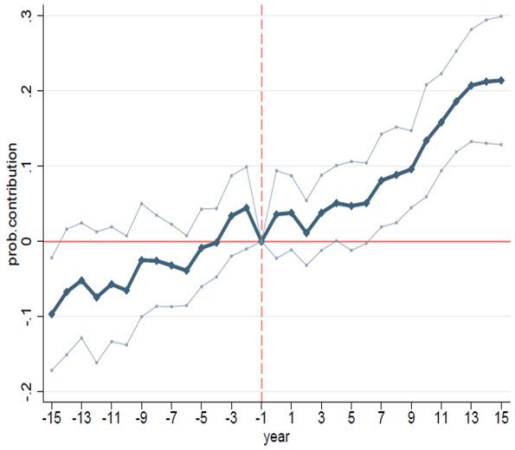
Figure 5 displays the effect of state exemption policies on contribution to retirement accounts using two estimators: one based on the contribution level and the other based on indicator of having a positive contribution (the probability to save) as the dependent variable. Both estimators use the same specification as in Equation (12). Figure 5a depicts the dynamic effects of the state retirement income tax breaks on contribution level, while Figure 5b plots the effects on the probability to save.

Figure 5. Dynamic Treatment Effects

A. Unconditional Contribution Level



B. Probability to Save



Note: Bold blue lines present the coefficient β at each k relative to base year (year before the exemption policy was adopted) as specified in Eq.(11), thin lines show their associated 95% CI levels.

The estimates from the event study models show downward trends in saving after states adopted their SRITE policies, though the coefficient estimates are only statistically significant for some years in the post-policy period, which suggests the consistent finding that the state policies discouraged workers to save additional amount in their retirement plan accounts. Meanwhile, the estimates for pre-policy years are consistently statistically insignificant, meaning that pre-trend assumptions in the DID approach in this study is plausible. Regarding the second estimator measuring the probability to save, it appears that the SRITE policies were associated with increases in the likelihood to contribute stably over time in the post-policy period. However, it seems to take time (after approximately 8 or 9 years) to see the significant impact on savings among states with SRITE policies. Noted that these estimates are different from those presented in Section 5.1, since they only tell the difference in contribution level over years among states with SRITE policies. Contrastingly, estimators specified in Section 5.1 show the difference between state with SRITE policies with states without such policies before and after the policies were adopted.

"Crowd-out" on other Retirement Savings and Taxable Savings.

To further understand the channels through which the declined in contributions to retirement plans would have led to a "crowd-out" in other alternatives, namely Individual Retirement Account (IRA) contributions and conventional savings in taxable accounts (nonretirement savings), I estimate two "crowd-out" parameters: changes in level of IRA balance and changes in level of taxable savings[25]. Instead of estimating how much savings in these accounts changed in response to a one dollar changed in contributions into employer-managed retirement accounts induced by the change in tax incentives (as those estimated in prior studies, e.g. Chetty et al.(2012, 2014)), I use a more relaxing specification to estimate the "crowd-out" effect on other retirement savings and taxable savings. That is, I use the same specification as defined in Equation (10), but with a different set of control variables. This approach is plausible for two reasons: (1) IRA distribution has the same property as the employer-sponsored retirement plans (e.g. 401(k) plans), and therefore, estimating the effect of the SRITE policies on IRA balance could be carried in the same fashion as examining this impact on employer-sponsored retirement plans, as in Section 5.1; and (2) looking at the overall change in wealth accumulation is of interest because it provides a snapshot of how much the exemption policies induced the change in non-retirement savings and other types of retirement savings.

Table 6 and 7 report the estimates for two parameters: IRA balance and taxable savings. Since the distribution of these account balances has large outliers, I use several approaches to obtain more precise estimates: (1) I trim the extreme values by winsorizing saving values by two

[25] This variable is derived from information on Savings/Checking/Money Market Accounts balance in the HRS data. Both IRA and taxable savings are observed in total balance, not flows into such accounts.

levels: 1% and 5%[26]; (2) I use an indicator for having positive balance; and (3) I measure saving balances as share of household earnings and as share of financial wealth.

With regard to IRA balance, the level estimate (Columns 1the Table 6) reveals that a decline in IRA balance by $11,814 (or 18%) was associated with the SRITE policies. Using winsorized values, the coefficient estimates show smaller effects (with narrower confidence interval), with one exception is that when using 5% winsorized values the estimate become positive and statistically insignificant. Of course, the decline in IRA balance could not be interpreted as a drop in contributing into these accounts. However, assume that macro investment conditions are similar between treated and comparison states, the declined balances might suggest at least lower contributions into IRAs among states with SRITE offers[27]. Additionally, other specification, as shown in Columns 3, 4, and 5 of Table 6 suggest that workers were not likely to save in IRAs, and the IRA balance as a share of total earnings and of financial wealth were not observed to increase, though these estimates are not statistically significant. Further, since the IRA balance in the HRS data does not distinguish between traditional and Roth IRA balance (traditional IRA is pre-tax savings while Roth IRA is post-tax savings), these findings may suggest a decline in savings among those with Roth IRAs because lower tax rate in the retirement period (due to the exemption) would cause higher tax liabilities in the current working period, hence, discourage these individuals to save in Roth accounts. However, further investigation should be carefully carried before a conclusion is made.

Table 6. "Crowd-out" Effect Estimation Results – IRA Balance

	(1)	(2)	(3)	(4)	(5)	(6)

[26] For example, with 5% level, values in the top decile are recoded to the 95th percentile and values in the bottom decile are recoded to the 5th percentile.
[27] Indeed, I estimate the changes in IRA withdrawals and find there is no statistically significant evidence on increase in withdrawal from IRA accounts following the adoption of SRITE policies.

		Winsorized levels				
	Levels	1 percent	5 percent	Prob. (Savings >0)	As share of Earnings	As share of Financial Wealth
RIExempt*Post	-11.814**	-9,075**	69	-0.011	-2.262	-2.992
	{5,579}	{4,490}	{2,813}	{0.012}	{3.628}	{8.131}
Pre-Policy Mean	*66,082*	*62,511*	*51,055*	0.53	*9.10*	*3.64*
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes	Yes	Yes	Yes
N	42,776	42,776	42,776	42,776	42,776	42,776

Notes: Data comes from the W2 SSA Administrative data linked to RAND HRS spanning 1991 to 2016. States with no state income tax are excluded. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimate presents results from separated regression with control variables. Control variables include indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household wealth terciles; indicators for occupation; state unemployment rate, state median income; share of over 65 year old population; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

When workers reduced their savings in tax-deferred retirement accounts, did they alter this deducted amount into other savings accounts? The hypothetical expectation is that if the substitution effect occurred, savings in alternative types with more liquid property than retirement plan accounts would be risen. However, such substitution effect was not observed. Table 7 reports the estimated results for taxable savings balance. It appears that across four outcomes, there is no statistically significant evidence on increase in saving into these accounts. Instead, the level estimates suggest a significant drop in savings by $ 6,197 (or 22%). When reducing the influence of outliners, the magnitude of the effects become smaller by approximately two-third with substantially narrower confidence intervals. Despite the noisy estimates for savings levels, these results support findings from previous studies showing that there is little substitution effects between tax-deferred retirement saving accounts such as 401(k)

and other personal financial asset savings and household wealth (Venti and Wise (1992); Hoynes and McFadden (1994); Engen, Gale and Scholz (1996); Poterba, Venti and Wise (1996); Gelber (2011)).

Table 7. "Crowd-out" Effect Estimation Results – Taxable Savings Balance

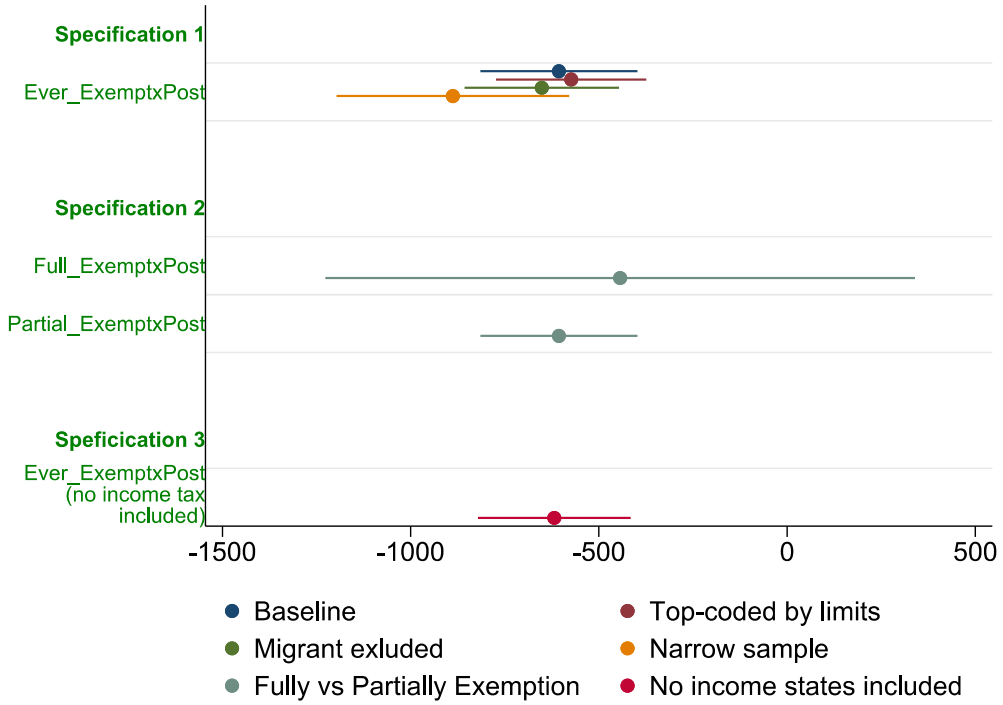
	(1)	(2)	(3)	(4)	(5)	(6)
		Winsorized levels				
	Levels	1 percent	5 percent	Prob. (Savings >0)	As share of Earnings	As share of Financial Wealth
RIExempt*Post	-6,197	-4,000***	-2,123***	-0.001	-0.681	0.003
	{4,076}	{1,302}	{647}	{0.008}	{0.638}	{0.078}
Pre-Policy Mean	*27,785*	*25,228*	*20,430*	*0.91*	2.62	0.54
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes	Yes	Yes	Yes
N	42,776	42,776	42,776	42,776	42,776	42,776

Notes: Data comes from the W2 SSA Administrative data linked to RAND HRS spanning 1991 to 2016. States with no state income tax are excluded. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimate presents results from separated regression with control variables. Control variables include indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household wealth terciles; indicators for occupation; state unemployment rate, state median income; share of over 65 year old population; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

Robustness Checks

To examine the sensitivity of the main results to modifications of the sample or the model specification I ran several robustness tests, as summarized in Figure 7[28]: The first four lines (Specification 1) compare the main coefficient - β - of the baseline specification (as in Column 1 of the Table 4) with other models in which samples are further restricted; the central two lines (Specification 2) show the coefficients – β_1 and β_2 from the model specified in Equation (11); and final line (Specification 3) displays the estimate from the model in which states without income tax are added.

Figure 7. Robustness Checks Summary



Notes: Data comes from SSA W2 Records linked to HRS RAND data, and geographic HRS data file from 1991 to 2016. Outcome variable: contribution level. Specification 1 use the baseline model (as in Equation (10), Specifcation 2 use the model as in Equation (11), and Specication 3 use the baseline model in which states without income tax are added. For each line, the dot shows the coefficient estimate of β, and the line presents its associated 95% confidence interval. All models are included control variables.

[28] The results presented is for the main outcome variables – contribution level. Other outcome variables are conducted, but not reported. Results are presented upon request.

First, since contributions to retirement plans are subjected to contribution limits[29] I re-ran the baseline model (Equation (10) in which the dependent variable – contribution level – is top-coded by the contribution limits. The coefficient estimate, as displayed in maroon line in the Figure 7, shows significantly similar to that of the baseline specification.

Second, as discussed in Section 4.2.1, migration across states probably contaminate treatment specification, specially migration into states with SRITE policies, and hence, the treatment effect estimated as in Column 1 of the Table 5 would potentially underestimated. If this is the case, then the estimates in which interstate migrants are dropped will produce a larger coefficient. To test this argument, I re-ran the baseline model in which interstate migrants were excluded. The results (as plotted in green line in the Figure 7) shows that the impact of the SRITE policies on contributions became larger (a fall by $652 or 25%).

Third, I re-estimated the Equation (10) with a narrow sample that was more consistent between the SSA data and the HRS data. For example, many individuals appeared on the W2 records but earned zero wages and self-reported to not be in the labor force in the HRS surveys, while a portion of the observations had zero contributions in the administrative data and reported not having any retirement plan in the survey data. For such reasons, I restricted the analytic sample to exclude those with zero wages and self-reported to not be working or not be in the labor market, further excluding those with zero contributions and self-reported to not have any retirement plan account. This results the analytic sample consists of 52,649 observations (about 34% of the sample was dropped). The main coefficient with its 95% confidence interval is exhibited in orange line in the Figure 7, showing consistent findings as in the Table 5 (the preferred specification). Further, and as expected, the sizes of the effects are clearly larger for

[29] For some reason, a number of observations (0.4 percent of the total sample) in the sample had contribution amounts were higher than the contribution limits.

unconditional contributions. The estimates for positive contributions are mostly the same between the two specifications.

Fourth, as discussed in Section 4.2, I estimated Equation (11) to test whether the effect of state retirement income exemption differed between full-exemption states and partial-exemption states. The middle two lines in the Figure 7 (Specification 2) present the coefficient estimates of β_1 and β_2 (in Equation 11). Apparently, the coefficient estimate for partial-exemption states is exactly the same as those in Table 5, and the expectation that the negative impact would have been larger among states with full-exemption policies is not observed.

Next, I included states with no income tax into the model and specified these states as states offer exemption. The last red line in the Figure 7 (Specification 3) presenting its estimates appears that the impact was almost the same as the main specification.

Finally, as observed in Figure 3, the savings into retirement plans are likely to raise or fall with similar pattern in wages, meaning that the estimated decline in contribution might be driven by the fall of earnings. To examine whether this is the case, I re-estimated the Equation (10), in which I replaced the dependent variable with taxable wages and gross wages (a sum of taxable wages and elective deferrals). As shown in Table 8, it reveals that state exemption policies were associated with a decline in gross wages by $ 1,277 (or 3%) (though the estimate is marginally statistically significant). Meanwhile, there was no observed evidence of the negative impact on taxable wages. The estimated declines in wages are smaller than those observed for the decline of contribution following the enactment of state retirement income exemption policies. Altogether, these findings suggest that the income effect induced by exemption policies would have been larger than the substitution effects, such that both contribution and labor supply were observed to have decreased in states with exemption policies.

Table 8. Annual Wages Estimation Result

	(1) Taxable Wages	(2) Total Earnings
RIExempt*Post	-670.6	-1276.8*
	{639.0}	{691.4}
Pre-Policy Mean	*38,712*	*41,254*
Year fixed effect	Yes	Yes
State fixed effect	Yes	Yes
Demographics control	Yes	Yes
State characteristics control	Yes	Yes
Adj R-squared	0.35	0.366
N	80,329	80,329

Notes: Data comes from the W2 SSA Administrative data linked to RAND HRS spanning 1991 to 2016. States with no state income tax are excluded. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimates present results from separated regression with control variables including indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for having health insurance (public insurance, employer-sponsored health coverage); indicators for household wealth terciles; indicators for occupation; state unemployment rate, state median income; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

5.2. The Effects on Income in Retirement

The second aspect of the study examines the impact of the SRITE policies on income in retirement, answering the question of if the reduction in savings for retirement in states with exemption policies would eventually make their seniors worse off compared to those who were in states that do not offer such exemptions. The distribution impact was measured by several main sources of income in retirement: retirement income, Social Security benefits, SSDI/SSI income, and incomes from other government programs. I present the estimation results using both individual and household samples as described in Section 3.

Individual Sample

Table 9 presents the estimation results for the impact of the state exemption policies on individual income in retirement, broken down by sources of income including retirement income (income from any retirement plans and annuities from retirement plan), Social Security (SS) income, SSDI and SSI income, and income from other sources of government transfer[30]. As expected, Columns 1 and 2 of the Table 9 show that retirement income (in both level and log transformation) is estimated to have reduced by about $907 (or 11%) in level and by 4% in the rate of change. Regarding SS benefits presented in Columns 3-8 of the Table 9, there is no detectable impact of the state exemption policies on SS income and SSI income, but a 40% reduction was observed for SSDI benefits, which is probably driven by a higher share of seniors who were 65 and older in SRITE states. This reduction makes sense because SSDI benefits are automatically combined with SS retirement income when individuals reach full retirement age (65 or 67 depends on birth cohort). In addition, income from other government transfers is also estimated to increase by 18% following the exemption policy.

[30] These types of income do not necessarily reflect all income sources that one person could earn. For example, income from other annuities and earnings are not reported here.

Table 9. Income in Retirement Estimation Results – At Individual Level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)	(11)
	Income from Retirement Plans (Pension Income)		Social Security Income		SSDI Income		SSI Income		Income from other social programs	
	Level	Log	Level	Log	Level	Log	Level	Log	Level	Log
RIExempt*Post	-907.5**	-0.155*	165.8	0.099	-284.7***	-0.125***	12.77	0.008	179.9**	0.043
	{458.8}	{0.082}	{135.8}	{0.068}	{77.35}	{0.048}	{21.77}	{0.019}	{76.14}	{0.042}
Pre-Policy Mean	*8,573*	*3.72*	*9,248*	*6.71*	*703*	*0.49*	*190*	*0.29*	*979*	*0.82*
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	90,485	90,485	90,485	90,485	90,485	90,485	90,485	90,485	90,485	90,485

Notes: Data comes from RAND HRS linked to restricted HRS data files spanning 1992 to 2016. Sample included retirees aged 40 and above and/or seniors aged 65 and above. Disabled individuals are excluded. States with no state income tax are excluded. The estimated coefficients reported for the indicators being 1 if an individual was resident in states provided retirement income tax exemption after the policy implemented and 0 otherwise. For each outcome variable, the coefficient estimates results come from separated regression with control variables. Control variables include indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of household members); indicators for health conditions, indicators for ever having health insurance; indicators for pre-retired occupation; number of working years working; state unemployment rate, state median income; share of over 65 year old population; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

The estimates for pension income as seen in Columns 1 and 2 of the Table 9 might underestimate the effects of the SRITE policies, as using the pooled sample means many retirees and seniors did not actually have any retirement plans, and/or were not eligible for retirement plans prior to their retirement. In such cases, the estimates using the pooled sample would be smaller than that of looking at the effects of the SRITE policies among those who reported to ever have any retirement plan before they retire. To do so, I re-estimated Equation (13), but restricted the analytic sample to only individuals who reported to ever have any type of private retirement plans (or tax-deferred retirement plans or DB plans) in their pre-retirement periods. Columns 3 and 4 of the Table 10 present the estimation results for this restricted sample. It reveals that effects appear to be larger, though the level estimate for retirement income is only marginally statistically significant. These results suggest that the induced reduction in contribution in the pre-retirement period would have led to a shortfall in retirement income. Further, it suggests that the SRITE policies were unlikely to encourage new savers. Consequently, an overall negative impact on pension income was observed.

Table 10. Retirement Income Estimation Results – Alternative Specifications

	(1)	(2)	(3)	(4)	(5)	(6)
	Main Specification		Ever Having Retirement Plans		Alternative Specification	
	Level	Log	Level	Log	Level	Log
RIExempt*Post	-907.5**	-0.155*	-1294.7*	-0.332***		
	{458.8}	{0.082}	{691.4}	{0.116}		
Pre-Policy Mean	*8,573*	*3.72*	*11,596*	*4.55*		
N	90,485	90,485	38255	38255		
Full-Exemption*Post					-1511.4*	0.583***
Mean					7673	3.57
Partial-Exemption*Post					-810.0**	-0.157**
					{372.7}	{0.079}
Pre-Policy Men					*8,573*	*3.72*
N					85,047	85,047
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Data comes from RAND HRS data from 1992 to 2016 linked to restricted HRS data files. States with no state income tax are excluded. Restricted sample included only individuals who ever reported to have retirement plans in pre-retirement years. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimates present results from separated regression with control variables including indicator variables for year; state; household heads' characteristics are used as proxy for household characteristics including demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for wealth terciles; indicators for occupation; job tenure; and net value of housing; state controls include state unemployment rate, state median income; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level

Household Sample

Tables 11a and b present the estimation results at the household level. Again, the directions of the effects on each source of the income retirement are consistent with results using an individual

sample[31]. Two exceptions are: (1) the estimates for retirement income are smaller and statistically insignificant; and (2) the log estimates of the SSI using the household sample becomes negative, though both estimates are statistically insignificant. It is noticeable that total household income is estimated to have dropped surprisingly large, by $9,124 (or 14%). However, such decline was not likely to be driven by either retirement income or social security benefits, and perhaps was driven by other income sources such as capital income or other earnings. Further, if the fall in household income were induced by the SRITE policies, one would expect that the after-tax income might not have changed with the same direction, or at least no change in after tax income. Because, as discussed in Section 3, other things hold equal, an exemption any income from tax base would lower effect tax rate, and after-tax income would be expected to be higher. However, the estimation results show the reversion. Table 13 shows the estimates for household income before and after tax from 2000 through 2014[32], both before and after-tax income are estimated to fall by 14% and 9%, respectively. These findings suggest that seniors in SRITE states experienced the benefits from the exemptions, however, they were still worse off than states without any exemption.

[31] Total personal income is not available in RAND HRS data, therefore total income is estimated only at household level.

[32] This is the time period that RAND HRS Tax Calculations files are available

Table 11a. Retirement Income Estimation Results – At Household Level

	(1)	(2)	(3)	(4)	(5)	(6)
	Total Income		Income from Retirement Plans		Social Security Income	
	Level	Log	Level	Log	Level	Log
RIExempt*Post	-9,124.2***	-0.074***	-765.5	-0.061	320.1	0.146**
	{2421.1}	{0.028}	{613.0}	{0.088}	{217.5}	{0.068}
Pre-Policy Mean	*65,493*	*10.57*	*13,119*	*4.90*	*14,059*	*7.37*
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes	Yes	Yes	Yes
N	93,306	93,306	93,306	93,306	93,306	93,306

Notes: Data comes from RAND HRS data from 1992 to 2016. States with no state income tax are excluded. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimates present results from separated regression with control variables. Control variables include indicator variables for year; state; household heads' characteristics are used as proxy for household characteristics including demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household wealth terciles; indicators for occupation; job tenure; and net value of housing; state controls include state unemployment rate, state median income; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level

Table 11b. Other Income in Retirement Estimation Results – At Household Level

	(7)	(8)	(10)	(11)	(12)	(13)	(14)	(15)
	Capital Income		SSDI Income		SSI Income		Income from other social programs	
	Level	Log	Level	Log	Level	Log	Level	Log
RIExempt*Post	-3,556.1**	-0.038	-251.1**	-0.094*	29.2	-0.001	296.4**	0.079
	{1646.5}	{0.071}	{110.5}	{0.054}	{29.39}	{0.025}	{117.1}	{0.055}
Pre-Policy Mean	*16,266*	*5.51*	*912*	*0.61*	*246*	*0.37*	*1,402*	*1.08*
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	93,306	93,306	93,306	93,306	93,306	93,306	93,306	93,306

Notes: Data comes from RAND HRS data from 1992 to 2016. States with no state income tax are excluded. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimates present results from separated regression with control variables. Control variables include indicator variables for year; state; household heads' characteristics are used as proxy for household characteristics including demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household wealth terciles; indicators for occupation; job tenure; and net value of housing; state controls include state unemployment rate, state median income; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level

Taken altogether, overall, state exemption policies would have led to decrease savings in retirement plan accounts, income from such pension plans when retiring was observed to decline at individual level but was not observed at the household level. The observation that both before- and after-tax household income declined among states with exemption policies was not probably driven by retirement income, but more likely by earnings and income from financial investment suggest a negative "spill-over" effects on other financial assets. Therefore, the results imply that the SRITE policies failed to promote workers to save in the working period, which led the income on net to have been lower when workers retired.

Table 13. After tax Household Income Estimation Results

	(1)	(2)
	Before-tax Income	After-tax Income
RIExempt*Post	-9,140.3***	-5,241.5***
	{2,633.6}	{1,710.7}
Pre-Policy Mean	*65,154*	*54,786*
Year fixed effect	Yes	Yes
State fixed effect	Yes	Yes
Demographics control	Yes	Yes
State characteristics control	Yes	Yes
N	69,319	68,186

Notes: Data comes from RAND HRS Tax Calculation spanning 2000 to 2014 linked to restricted HRS data. States with no state income tax are excluded. The estimated coefficients reported for the indicators show whether an individual was resident in states provided retirement income tax exemption after the policy implemented. For each outcome variable, the coefficient estimates present results from separated regressions with control variables. Control variables include indicator variables for year; state; household heads' characteristics are used as proxy for household characteristics including demographics variables (age, gender, race, marital status, education, number of children); indicators for health conditions, indicators for having health insurance; indicators for household income terciles; indicators for occupation; job tenure; and net value of housing; state controls include state unemployment rate, state median income; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

6.Conclusions

For decades, states have provided personal income tax exemptions, deductions, and/or credits for retirement income with two specific aims: (1) to promote income adequacy for the seniors; and (2) to serve as a means to attract retirees to, and to keep old adults, in a state. While the vast literature on the relationship between tax incentives (at national level) and retirement savings have been intensively studied, there is not much understanding of these state-level policies and how they impact the working class toward saving for retirement, and how they eventually impact individuals' income in later life.

Within the thin literature on the impact of these state policies, a few studies focus on the consequences of these policies on state revenue loss and out-migration across states among seniors (Brewer et al., 2017; Conway & Rork, 2008; 2012; 2014; Edwards & Wallace, 2004; Forman, 1995; Pan & Wagner, 2011; Penner, 2000; Wheeler, 2000; Onder & Schlunk, 2015). This study fills the gap by first providing evidence on the effects of the state retirement income exemption policies on savings behaviors and then exploring how these policies impact income in retirement.

The two-way fixed effect models using the SSA W2 earnings records linked to RAND HRS data and restricted geographic data from the HRS data show that the state retirement income exemption (SRITE) policies were associated with an average decline in unconditional elective deferrals and/or contribution to retirement plan accounts by $606 (or 23%) after the exemptions imposed and by $731 (or 10%) conditioning on a positive contribution. The dynamic treatment effect model supports the main finding that the SRITE policies induced workers to save less after the policies were enacted. Although the model shows that workers in the SRITE states were more likely to save after states enacted the exemptions, the contribution level appears

to decline persistently over time in the post-policy period. Additionally, the contributions as share of gross wage is also estimated to fall by 0.1 percentage point, meaning a $1 increase in gross wage would have led to a decline by 1 cent in contributions. Further, the estimation models also imply relatively little "crowd-out" in taxable savings accounts, similar to prior studies (Poterba, Venti & Wise, 1996; Hoynes and McFadden, 1994;Venti & Wise,1993) by showing that no increase in taxable savings account following the exemption policies and supports the early finding that the SRITE policies would likely have induced individuals to work less rather than changing their savings channels. Next, when looking at the long-term impact of the SRITE policies the estimation results for income in retirement, I find that retirement income at individual declined by $907 (or 11%), and by $765 (or 6%) at household level (though the estimates for household is statistically insignificant), and total household before-tax and after-tax income fell by 14% and 9%, respectively. However, the decline in total household income in both before and after tax associated with the SRITE policies were not likely to have been driven by retirement income or Social Security retirement at household level.

Several caveats are noted. First, the ideal set up in this study is to observe individuals in two periods: a working period when contributions to retirement plans are observed, and a retirement period when their incomes are reported. However, such a setting is impossible given the small sample of the HRS data and the permission to disclose earnings records among a sub-set of the HRS respondents. Therefore, the estimates for income using the pooled sample might be the lower bound of the treatment effects. Second, the key advantage of the W-2 record is to mitigate measurement errors that could appear in the self-reported survey data. However, because the W2 records did not indicate eligibility for tax-deferred retirement accounts (such as 401(k)), it is hard to tell whether the zero contribution means that an individual was eligible but

chose not to contribute, or that she/he was not eligible to participate into these retirement plans. Finally, one argument on savings in retirement plan accounts related to the SRITE policies is that workers who are at the margins of income tax brackets might have more incentives to save into their retirement plans in order to lower their tax payment. As such, it is expected that the contributions to retirement accounts would have been higher after the SRITE policies were implemented. However, due to the complexity of the restricted HRS data agreement, the tax calculation is not simple and requires more work in the future[33].

Despite of these limitations, this first study provides the causal effects of the state retirement income exemption policies on saving for retirement as well as its long-term impact in later life, which have been under-studied. While there was clear consequence of such policies on state revenue (Conway & Rock, 2014), the observed decline in savings into retirement plans suggest the policies discouraged current savers and new participants as well. The findings that workers in the SRITE states were more likely to save, but the amounts contributed in retirement plans dropped overtime in post-policy periods might reflect three facts: (1) workers had a lack of access to retirement plans and therefore both contributions and retirement income were not observed in the sample, consequently, the SRITE policies did not work among these group of workers; (2) among those who were eligible for retirement plans, the SRITE policies did not encourage individuals to increase their savings into these accounts. Hence, together with (1), a substantial portion of workers did not have any contributions; and (3) among workers who had retirement plans and positive contributions, they appeared to be financially better positioned and be higher educated. This group actually responded to the policy by significantly reducing their

[33] A simple estimate was carried by splitting the sample by levels of wages. The results among high earners (those with gross wages greater than $75,000, and those with gross wages greater than $100,000) show this is not the case.
The negative impact was observed among these high earners. Results will be presented upon request.

savings. These observations suggest that policies that offer incentives such as price subsidies or retirement income exemption are not effective in increasing savings. Perhaps, automatic enrollment combined with the SRITE policies would lower fiscal costs and potentially positive impact on workers, especially on those who had low incentives to save for retirement. In addition, recent movements in implementing state-run retirement programs in which states require employers (especially small and medium-size firms) to provide retirement plans with default rate to their employees is predicted to create larger effects on low-income workers.[34] Future work will be needed to compare these programs with the current policies to further examine the effectiveness of the tax incentive policies.

[34] Ten states (California, Connecticut, Illinois, Maryland, Massachusetts, New Jersey, New York, Oregon, Vermont, and Washington) have enacted state mandated retirement plans, in which California, Illinois, and Washington established the programs and recently started to enroll workers into such programs.

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Appendices

APPENDIX A

Table 1. State Income Tax Exemption on Pension and Retirement Income, 2014

No Income Tax	Social Security			Public Pension			Private Pension		
	Full	Partial	None	Full	Partial	None	Full	Partial	None
Alaska	Alabama	Colorado	New Mexico	Alabama	Arizona	California	Hawaii	Alabama	Arizona
Florida	Arizona	Connecticut	Rhode Island	Hawaii	Arkansas	Connecticut	Illinois	Arkansas (for IRA accounts)	California
Nevada	Arkansas	North Dakota	Utah	Illinois	Colorado	Utah	Mississippi	Colorado	Connecticut
South Dakota	California	Iowa	Virginia	Kansas	Delaware	Virginia	Pennsylvania	Delaware	Utah
Texas	Delaware	Kansas		Louisiana	DC	Maryland		DC	Virginia
Washington	DC	Missouri		Massachusetts	Georgia	Minnesota		Georgia	Idaho
New Hampshire	Georgia	Montana		Michigan	Idaho	Nebraska		Iowa	Indiana
Wyoming	Hawaii	Minnesota		Mississippi	Indiana	New Mexico		Kentucky	Kansas
Tennessee	Idaho	Nebraska		New York	Iowa	North Carolina		Louisiana	Maryland
	Illinois	Vermont		Pennsylvania	Kentucky	North Dakota		Maine	Massachusetts
	Indiana	West			Maine	Ohio		Michigan	Minnesota

	Virginia		
	Kentucky	Missouri	Oregon
	Louisiana	Montana	Rhode Island
	Maine	New Jersey	Vermont
	Maryland	Oklahoma	
	Massachusetts	South Carolina	
	Michigan	West Virginia	
	Mississippi	Wisconsin	
	New Jersey		
	New York		
	North Carolina		
	Ohio		
	Oklahoma		
	Oregon		

Missouri	Nebraska		
Montana	New Mexico		
New Jersey	North Carolina		
New York	North Dakota		
Oklahoma	Ohio		
South Carolina	Oregon		
Wisconsin	Rhode Island		
	Vermont		
	West Virginia		

	Pennsylvania South Carolina Tennessee Wisconsin		

Source: Author's Summary from State-by-State Tax Expenditure Reports and State's Taxation Legislatures.

Note:
Alabama - Income from DB plans only
Tennessee - The individual income tax is imposed only on individuals and other entities receiving interest from bonds and notes and dividends from stock. Persons over 65 with total income less than $33,000 for a single filer or $59,000 for a joint filer are exempt.
Virginia - provides individual taxpayers aged 75 or older a deduction of up to $12,000 ($24,000 married filing jointly.) For taxpayers aged 65-74, the $12,000 deduction is reduced and phased out at higher income levels, beginning at $50,000 for single taxpayers and at $75,000 for married couples regardless of their filing status. The base is state-adjusted federal AGI.
Maryland-Taxpayers aged 65 and over are entitled to an exemption of $29,000 per person minus SS/RR benefits.
Minnesota- Taxpayers aged 65 and over may be entitled to an exemption of up to $9,000 for single taxpayers and $18,000 married and filing jointly if both spouses are over 65. Income limits apply.
Ohio-A retirement income tax credit of as much as $200 is allowed, depending on income. A senior citizen tax credit of $50 per tax return is allowed to filers of 65 or older; each taxpayer may claim it only once. A one-time tax credit is available for lump-sum distributions to people over 65: $50 multiplied by remaining life expectancy.
Oregon-9% credit for retirement income

APPENDIX B

Table 2. The Effects of SRITE Policies on Interstate Migration

	(1) Pooled Sample	(2) Working Sample	(3) Senior Sample
RIExempt*Post	0.007*** {0.002}	0.007*** {0.002}	0.004*** {0.001}
Pre-Policy Mean	0.019	0.018	0.015
Year fixed effect	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Demographics control	Yes	Yes	Yes
State characteristics control	Yes	Yes	Yes
N	19,482,525	13,088,489	4,701,710

Notes: Data comes from IPUMS ACS 2000-2018. The coefficient reported is the interaction between the indicator for being in states offered retirement income exemption and the indicator for being in post-policy period. Each coefficient results from a separated regression. Dependent variable is indicator for moving into states with SRITE policies. Control variables included indicators for states, years; individual demographics (age, gender, race, educational attainment, marital status, family size); household income terciles, occupation, indicator for working last year; indicator for working for wages; state control variables including state annual unemployment rates, state household median incomes, state housing price indexes, and indicator for providing any EITC. Working sample (age 30-60) includes those who reported to be on the labor market Senior samples included individuals aged from 60 years old. States without income tax are excluded. Individuals who reported to be in school are also excluded. All estimates use sample weights. The standard errors are clustered at state-year level. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

APPENDIX C

Table 3. The Effects of SRITE Policies on Contributions Among Movers

	(1)	(2)
	Among movers	Among movers to state with SRITE policies
RIExempt	344.4	1,844.10
	{1850.7}	{2429.2}
Year fixed effect	Yes	Yes
State fixed effect	Yes	Yes
Demographics control	Yes	Yes
State characteristics control	Yes	Yes
Adj R-squared	0.11	0.17
N	4,744	1,943

Notes: Data comes from the W2 SSA Administrative data linked to RAND HRS spanning 1991 to 2016. States with no state income tax are excluded. Dependent variable is the contributions to retirement plans. The estimated coefficients reported for the indicator shows whether an individual was resident in states provided retirement income tax exemption. For each outcome variable, the coefficient estimates present results from separated regression with control variables including indicator variables for year; state; demographics variables (age, gender, race, marital status, education, number of children); indicators for having health insurance (public insurance, employer-sponsored health coverage); indicators for household wealth terciles; indicators for occupation; state unemployment rate, state median income; and state housing indexes. Monetary values are deflated in 2016 dollars. All estimates use sample weights. The standard errors are robust. *** indicates statistical significance at the 1% level; ** indicates the 5% level, and * indicates significance at the 10% level.

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