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Lost in Complexity? The Impacts of Health Insurance Literacy on ACA-Induced Retirement

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ABSTRACT

Policy effectiveness can depend on the level of understanding that targeted beneficiaries have toward the policy. In particular, low levels of health insurance literacy can mitigate the labor market implications of the Affordable Care Act (ACA). In this paper, we estimate the effect of the ACA on workers retirement decisions, while accounting for their heterogenous levels of insurance literacy. Using difference-in-differences and triple-differences estimations, we find that the ACA accelerates retirement for individuals who did not have access to post-retirement insurance benefits from their employers by 0.31 years. Moreover, those with higher literacy had significantly larger reductions in retirement age, specifically a further reduction by 0.41 years than their respective counterparts. In addition to validating the job-lock removing effect of the ACA, our findings highlight the value of promoting health and health insurance literacy in order to enhance the efficacy of the healthcare reform measures.

KEYWORDS: ACA, health insurance, health insurance literacy, retirement

JEL CLASSIFICATION: I1, J2

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I. INTRODUCTION

In the US, there exists a uniquely strong linkage between employment and health insurance whereby most individuals obtain insurance from their employers until they reach the Medicare eligibility age of 65 (Anderson et al., 2003; Garber and Skinner, 2008). In 2010, 63.3% of firms—with more than 200 workers—still provided employer-sponsored insurance (ESI) to their employees for their active working-years (Claxton et al., 2010). Given the ties between insurance and employment, any policies altering the current structure of insurance provision is likely to significantly impact labor supply behaviors.

Among employers who sponsor insurance, only 36.3% additionally offer retirement-health insurance (RHI), an extension of the ESI coverage during the post-retirement years (Claxton et al., 2010). The literature has found that employer-sponsored RHIs encourage early retirement by providing an insurance buffer for workers considering retiring before the Medicare eligibility age (Blau and Gilleskie, 2006; French and Jones, 2011; Johnson et al., 2003). In contrast, the majority of workers who only have ESI, and not RHI, are not only discouraged from retiring early, but may also feel locked in their jobs. In a phenomenon known as *job-lock*, individuals who do not have employer-sponsored RHIs or affordable alternatives during the post-retirement years cannot freely leave their jobs in the fear of losing coverage (Blau and Gilleskie, 2006; French and Jones, 2011; Rust and Phelan, 1997).[1]

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[1] Prior to ACA, the RHIs served as a main source of insurance for early-retirees exiting labor force before the Medicare eligibility age of 65 (Robinson & Clark 2010). While insurance facilitated through the Consolidated Omnibus Budget Reconciliation Act (COBRA) was the closest alternative to the RHIs, the job-lock removing effect of the COBRA was not as significant as that of the RHIs. First, COBRA was offered for up to 18 months—a time frame too short to give individuals sufficient retirement security to plan for early retirement. Also, retirees on COBRA had to bear the full amount of the insurance premiums plus a 2% additional administrative fee. Given the short duration and the high costs of insurance provided through COBRA, the RHIs remained the best option for aging workers to retain health insurance in their post-retirement years—should they choose to exit the labor force before age 65 (Shoven and Slavov, 2014).

Passed in 2010, the Affordable Care Act (ACA) created a new insurance option through establishing the health insurance exchange.[2] The health insurance exchange helps individuals enroll in affordable medical insurance, independently of their employer. A universal application is used to facilitate access, and individuals whose household income falls within the range of 100 and 400 percent of the federal poverty level (i.e., the 400% is equivalent to $48,500 in 2015 in a four-member household) can have their insurance premiums subsidized (Shoven and Slavov, 2013).[3] Because the newly introduced exchange creates a viable, cost-effective alternative to RHI by allowing all individuals under 65 to purchase plans regardless of their employment statuses, the job-lock theory postulates that the ACA should accelerate retirement—particularly among employees without employer-sponsored RHI benefits (French and Jones, 2011; Gallen and Mulligan, 2013; Gustman et al., 2018; Kaiser Family Foundation 2011; Nyce et al., 2013).

However, recent studies examining this relationship have found conflicting results—with some showing that the ACA holds a significant influence on retirement while others finding null effects (Ayyagari, 2017; Gustman, Steinmeier, and Tabatabai, 2018; Levy, Buchmueller, and Nikpay, 2015; Dillender et al., 2016). Those who found no effect of the ACA on either retirement decisions or retirement plans utilized analysis periods ending in 2014—tracing only 1 to 2 years after the legislation for the exchanges (Gustman et al., 2018; Levy et al., 2015). The short time-span since the ACA's enactment likely contributed to a limited ability to observe the reform's full impact on labor supply behaviors. Studies that have found an ACA-associated

[2] We use the terms "exchange" and "marketplace" interchangeably.

[3] This subsidy rule covers the majority of Americans. The FPL in 2013 was $11,490 for singles and $15,510 for married; the subsidy covering up to the 400 percent of the FLP will extend to $46,879 for singles and $63,280 for married—assuming a 2% cost of living adjustments in the FPL for 2014. The sliding scale of ACA subsidies for the silver plan is as follows: 2% for income level up to 133% of FPL; 3-4% for 133-150% of FPL; 4-6.3% for 150-200% of FPL; 6.3-8.05% for 200-250% of FPL; 8.08-9.5% for 250-300% of FPL; and 9.5% for those earning 300-400% of the FPL. (Shoven and Slavov, 2013).

increase in retirement plans were limited to specific industries—such as retail, accommodation, and food services—or did not distinguish between the effects of the health insurance exchanges and other policies initiated by the ACA that can affect retirement decisions (e.g., Medicaid expansions, individual mandates to purchase health insurance, reforms to benefit design, etc.).

Moreover, one potentially important, yet relatively overlooked, factor in the assessment of the role played by the exchanges on labor supply is health insurance literacy (Bhargava et al. 2015; Handel, 2013; Abaluck and Gruber, 2016; Myerson 2018). In devising a comprehensive healthcare reform, policy-makers behind the ACA introduced a myriad of policy changes to expand insurance coverage, control healthcare costs, and improve healthcare service and product delivery systems. Given the sheer number of policies and their interactions, it can be daunting for a lay person to understand all moving parts of the ACA and to act on the newly created opportunities. Recognizing the complexity in specifically insurance plan selection, policy-makers mandated that states implement in-state ACA Assister Programs in 2013. The programs are designed to train Assisters (e.g., Navigators and In-Person Assisters) so that they can help consumers improve their understanding and usage of the insurance marketplaces—or their overall insurance literacy.

In this paper, we shed new light on the impact of the health insurance exchange on retirement decisions by considering a longer analytic period, distinguishing between different policies introduced by the ACA (i.e., accounting for conflation between the opening of insurance exchanges and Medicare expansion), and importantly, identifying the role of insurance literacy measured by the degree of availability of the ACA Assister Programs.[4] Relying on data from the

[4] "Health insurance literacy measures the degree to which individuals have the knowledge, ability, and confidence to find and evaluate information about health plans, select the best plan for their financial and health circumstances, and use the plan once enrolled." https://www.huffingtonpost.com/bruce-caswell/health-insurance-literacy-is-key-to-reaching-uninsured-populations-this-open-enrollment-period_b_8524332.html

Health and Retirement Study (HRS) between the years 2006 and 2016, we examine the retirement plans of individuals between ages 40 and 64 who are currently working and has ESIs. First, we employ a difference-in-difference (DID) framework where we compare (1) individuals with ESIs and RHIs through employers to individuals with ESIs but no RHIs (2) before and after the introduction of the health insurance exchange. Next, using a triple difference (DDD) regression, we additionally compare individuals with varying levels of health insurance literacy, which changes *differentially* across states due to state-specific differences in the amount of funding injected into the ACA Assister Programs. We assess the robustness of our results by including a rich set of covariates and state-specific year trends.

Because an individual's purchase of private insurance depends on not only the availability of the health insurance exchange but also its generosity, we re-run the DID and DDD regressions while replacing the second—temporal—difference with the between-state differences in the exchange generosity based on the benchmark premium rates and subsidies.[5] Steering away from the simple DDD setup, we also conduct a staggered DDD modeling by replacing the uniform timing of the first open enrollment period of exchanges (i.e., the source of variations for the second difference) with the varied timing at which the states enacted the legislation for the exchanges. Finally, we consider an alternative planned retirement outcome: the expected probability of continue working at age 65.

We find that, compared to those who had RHIs through employers, those without RHIs accelerate their expected timing of retirement by 0.31 years. Based on the triple-differences estimation results, a one-percent increase in insurance literacy (i.e., measured by the financial support injected to the ACA Assister Programs per uninsured person) further increases the effect

[5] The benchmark premium is calculated for the second lowest silver plan of a 40-year-old whose income level is at the 210% of poverty.

of the exchanges on early retirement for the treated group by 0.41 years. Our findings are consistent with the predictions of the job-lock theory which postulates that ACA will hasten retirement for those job-locked by increasing their access to post-retirement insurance independent of employment. Moreover, we add to a small but growing literature on health insurance literacy by emphasizing the role of literacy levels in individual decision-making. Our results indicate that complex policy changes—specifically within insurance provision—ought to be complemented by efforts to increase the target population's understanding of the changes.

II. CONCEPTUAL FRAMEWORK

We begin by explaining the rationale behind job-lock. We apply the theoretical framework of insurance-induced job transition behaviors, introduced by Gruber and Madrian (2002), to the context of retirement decisions. Then we consider how insurance literacy can affect insurance-induced job lock and retirement decisions.

II.A. Insurance-Induced Job Lock

To illustrate the role of insurance-induced job-lock on retirement decisions, assume a simplified world where labor supply decisions of workers involve deciding only between employment (i.e. 'working') and non-employment (i.e., resorting to full and permanent retirement before the Medicare eligibility age of 65). All firms here are considered identical, thus creating no incentives for the workers to choose among firms. Consider an individual who is currently working and trying to decide whether to continue working or retire. For simplicity, assume that her utility is a function of only wage, leisure, and access to health insurance, and assume that wage is the sole product of labor. In the absence of insurance, it is straightforward to show that it is optimal for this individual to retire if her marginal utility of taking full-retirement is greater than her marginal utility from the marginal product of labor (i.e. wages).

The dynamics can change when insurance is added to the picture: if her valuation of maintaining the health insurance coverage is sufficiently large—larger than the preference for retirement—and if she were to lose coverage entirely by retiring without RHIs from her employer, the insurance 'locks' her in her job. The strength of the job lock will depend on the individuals' value of health insurance and their ability to access health insurance independent of employment.

We apply this conceptual framework to the context of the ACA. Workers with both ESI and RHI already have insurance coverage guaranteed for the post-retirement years, so they can retire from their current job at any time without a fear of losing coverage. In contrast, workers with ESI and no RHI will lose coverage if they retire from their current jobs. Thus, in the absence of other access to post-retirement insurance, individuals with ESI and not RHI will be locked into their jobs to maintain insurance coverage. The introduction of exchanges in the ACA should have a greater impact on the retirement decisions of workers with only ESI and no RHI, relative to those with both ESI and RHI.

From this framework, we devise our first hypothesis: For individuals who do not have access to RHIs through employers, the ACA will have a job-lock removing effect similar to that of the RHIs—accelerating the timing of retirement.

II.B. Insurance Literacy, Insurance Uptake, and Retirement

In contrast to what is theorized above, recent studies that evaluate the impact of the ACA on retirement decisions have generated puzzling results. Levy, Buchmueller, and Nikpay (2015) examine discrepancies in actual retirement patterns in 2015 between workers in states that anticipate the adoption of state-based insurance exchange through ACA and those in non-anticipating states. Even after controlling for the impact of Medicaid expansion, the authors found no significant change in actual retirement patterns of individuals in the ACA-participating states. Considering that workers may not be able to instantaneously act upon the retirement incentives embedded in the ACA, Gustman, Steinmeier, and Tabatabai (2018) examine changes in the retirement plans as opposed to actual retirements behaviors, but they also found no significant evidence that ACA has affected retirement.

While Dillender et al. (2016) and Ayyagri (2017) provide suggestive evidence that the short analysis period can explain the null findings, there can be other understudied elements that are in play. In particular, we suspect the impact of ACA can be affected by the insurance literacy of the target beneficiaries—in other words, the extent to which target beneficiaries actually understand the changes in insurance provision.

A priori the empirical evidence, it is unclear how insurance literacy affects retirement decisions when insurance access expands. Assuming risk-aversion and Jensen's Inequality, both of which ensure the strict concavity of worker utility functions, the expected utility of an insurance expansions will be lower for the individual with lower literacy.[6] This observation is independent of an individual's monthly insurance premium and probability of falling ill, and it holds true under the assumption that those with low health insurance literacy do not overestimate the true payout amount of insurance plans (De Meza and Webb, 2001; Myerson, 2018). In this case, lower-literacy individuals will face greater uncertainty from unknown insurance payouts.

[6] Assuming all individuals regardless of their literacy levels are risk averse, their preferences for any insurance F(·) can be written using the Jensen's Inequality in terms of insurance F(·) and utility u(x):
$\int_{-\infty}^{\infty} u(x)dF(x) \leq u\left(\int_{-\infty}^{\infty} x dF(x)\right)$, for all F(·).

As a result, they are more likely to remain working, fail to take up post-retirement insurance from the exchange, remaining under the influence of ESI-induced job lock. Because of uncertainty, those without employer-sponsored RHI and higher literacy will be more likely to purchase insurance plans through the exchange and free themselves from job-lock, relative to their counterparts with lower literacy.

Yet at the same time, assuming there is a strong and positive association between 'health insurance literacy' and 'health literacy,' it is possible for individuals with low literacy to over-enroll in the exchanges as they over-estimate their future health risks (Myerson, 2018).[7] The divergent directionality of the insurance uptake scenarios implies their having opposing effects on retirement, and the empirical results of the estimation model in this paper will show the net effect of the two.

II.C. Background on ACA Health Insurance Exchanges and Assister Programs

In this paper, we will rely on variation across time from the establishment of health insurance exchanges and variation across states in ACA Assister Program funding. There are three types of insurance exchanges: state-based, state-federal partnership, and federally-facilitated.[8] A state that has a state-based exchange is responsible to oversee all exchange functions including their IT platform (i.e. exchange website) from which consumers can purchase insurance plans. A state with a state-federal partnership relies on the Department of Health and Human Services (HHS) to handle all exchange functions except the management of

[7] Title V of the Patient Protection and Affordable Care Act (2010) defines health literacy as the capacity to obtain and process health information to make accurate health decisions.

[8] Definitions for the types of marketplace are provided below (source: https://www.kff.org/health-reform/state-indicator/state-health-insurance-marketplace-types). In this study, we equate state-based and state-based marketplaces that incorporate federally-facilitated Marketplace IT platform.

insurance plans offered on the exchange. Lastly, a state with a federally-facilitated exchange grants the HHS full authority to oversee all exchange functions.

There is a considerable variation in the timing at which the states passed legislations for launching the insurance exchanges—from as early as Sept. 2010 in California to July 2013 in Delaware.[9] Further details on the dates and the title of the legislations are provided in the Appendix, **Table A1**. Regardless of the legislation dates, all states were required by federal law (45 CFR 155.410) to hold their first open enrollment periods for the insurance exchanges between October 1, 2013 and March 31, 2014. Because our data (discussed in Section 3) is biennial, our main specifications do not rely on this month-to-month variation, and instead, treat 2014 as the first period in which the exchanges launched.

Since the start of the insurance marketplaces in late 2013, all states have been required by law to implement in-state ACA Assister Programs to consumers in need. The programs are designed to train assisters so that they can help consumers improve their understanding and usage of the insurance marketplaces—and as a result, increase their overall insurance literacy. While all states exchanges maintain Assister Programs, their nature, as well as funding source, depends on the type of the exchanges.

There are five funding sources are available for the Assister Programs: Navigators, In-Person Assisters (IPA), Certified Application Counselors (CAC), Federally-Qualified Health Center Assisters (FQHCA), and Federal Enrollment Assisters (FEA). While the CACs comprise the largest of the marketplace assister programs in terms of the number of personnel (i.e. 45-65% between 2014 and 2016), their funding comes from a variety of private sector sponsorships in

[9] While states with federally-facilitated exchange did not pass legislations, we refer to the timing at which the states made official announcement of their intention to launch the federally-facilitated exchange, thus granting full authority to the HHS to oversee their marketplaces.

lieu of states and thus are particularly difficult to track the funding sources (Pollitz et al., 2014). Hence, we exclude CAC funds when calculating each state's total amount of Assister grants received. We also ignore funding from FEAs since they comprise only 0-1% of the funding source between 2014 and 2016 (Pollitz et al., 2014). In short, the rest of this paper refers only to Navigators, IPAs, and FQHCAs when referring to the Assister Program funding sources.

[Insert Table 1 Here]

As shown in **Table 1**, these three types of ACA Assister Programs are used in different combinations, based on the type of insurance exchange.[10] All states are eligible for and have received the FQHCA funding. The Navigator funding is given only to states with federally-facilitated and federal-state partnership marketplaces. Lastly, the IPA funding is given only to the states with partnership and state-based marketplaces.

III. STUDY DATA AND METHODS

III.A. Analysis Sample

Data is drawn from the Health and Retirement Study (HRS), a biennial survey representative of older Americans.[11] The HRS contains information on retirement plans, retirement expectations, employment history, health, health insurance, financial and housing

[10] Definitions for the types of marketplace are provided below (source: https://www.kff.org/health-reform/state-indicator/state-health-insurance-marketplace-types). In this study, we equate state-based and state-based marketplaces that incorporate federally-facilitated marketplace IT platform. The names of the ACA Assister Programs are equivalent to the names of their funding sources.

[11] Currently, a total of thirteen HRS waves are available from 1992 to 2014. Throughout the two decades, the HRS has included six cohorts: HRS cohort born between 1931 and 1941, AHEAD cohort born before 1924, Children of Depression (CODA) cohort born 1924 to 1930, War Baby (WB) cohort born 1942 to1947, Early Baby Boomer (EBB) cohort born 1948 and 1953, and lastly, Mid Baby Boomer born between 1954 and 1959.

wealth, income, Social Security and pension, family structure, and basic demographics of age-eligible respondents and their spouses/partners. For this study, we use the HRS data from 2006 to 2016 and merge the restricted-use geographic and occupational identifiers.

We confine our sample to individuals ages 40 to 64, all of whom are still working and have ESIs for active-working years. In doing so, we exclude individuals aged 65 and above as they are eligible for Medicare. For all estimations, our main outcome variable is the age of planned retirement, defined as the age at which an individual expects to leave her current job. We include individuals who plan to leave their current occupations to enter full-retirement as well as those entering partial retirement (i.e. getting part-time jobs and starting self-employed work) because the removal of the ESI-induced job lock in an individual's current occupations can lead to both full- and partial- retirements. While planned retirement may differ from actual retirement, the planned retirement variable offers two important advantages. First, the short lapse since the introduction of the exchanges precludes the ability to observe the full effect of the ACA on actual retirement behaviors, and the planned retirement variable allows us to examine anticipated changes in an individual's retirement behavior. Second, the planned measure—which is ascertained in each wave of the survey—allows us to capture within-individual variations in retirement decisions across time (i.e. individual fixed effects).[12]

The HRS offers a rich set of variables that are potential determinants of retirement, including individual demographic information (i.e. age, marital status, and number of dependents), a natural log of individual annual earnings, and a natural log of household total net

[12] Most individuals who fully retire do not revert to working again, so there is little variation in retirement behavior within an individual.

wealth.[13] In order to control for retirement incentives embedded in employer-sponsored pension plans, we categorize individuals based on whether they have access to defined-benefit pension plans, defined-contribution plans, or do not have any coverage at each interview year.[14] We also identify individuals who collect Social Security income from those who do not. As we include in our sample only those who are working and under age 65, SS income receipt is a proxy for those with limited financial means. The HRS respondents' health status is captured via a health index that takes into account a number of critical, work-impeding medical conditions; the index is normalized to have mean of zero and a standard deviation of one, with a higher value corresponding to better health.[15]

Whether an individual purchases private insurance plans at the exchange depends not only the availability of the exchange but also its *generosity*. A simple way to estimate the generosity of exchanges is to compare their benchmark premiums and subsidies. We calculate the monthly premium for the second-lowest silver plan of a 40-year-old non-smoker earning an average annual salary at 210% of poverty level (i.e. approximately $50,000) in the largest city of each state. The post-tax credit subsidy premium rates for the silver plan in many states end up being similar despite large differences in their pre-tax credit subsidy premium amounts due to the varying levels of subsidy. Thus, we estimate the exchange generosity by the maximum percentage of the pre-tax credit subsidy premium subsidized in each state.

[13] Individuals who are retired and thus have zero earnings are excluded from the data. The net wealth includes information on the checking and savings accounts, bonds, stocks, deposits, mutual funds, primary and secondary housing, and any other savings less debt has also been included as a covariate.
[14] Individuals who are covered in the defined-benefit pension plans tend to face stronger early retirement incentives due to the particular nature of the defined-benefit accrual (Shoven and Slavov, 2014).
[15] The conditions include 1) high blood pressure or hypertension; 2) diabetes or high blood sugar; 3) cancer or a malignant tumor of any kind except skin cancer; 4) chronic lung disease except asthma such as chronic bronchitis or emphysema; 5) heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems; 6) stroke or transient ischemic attack (TIA); 7) emotional, nervous, or psychiatric problems; and 8) arthritis or rheumatism.

III.B. Measuring Health Literacy

We measure individuals' health insurance literacy using state-specific variations in the provision of ACA Assister Program. In doing so, we take into consideration the fact that the ACA and its Assister Programs are set to alter not only the availability of insurance but also the level of insurance literacy over time. Since its launch in 2013, the ACA Assisters provide outreach and education, technical assistance necessary to navigate the exchanges, and guidance in making informed plan-choices to individuals who are eligible to purchase plans and yet suffer from low insurance literacy (Pollitz et al., 2016). Given the purpose of Assisters, we assume that the increased ACA Assister Program funding implies an increase in the insurance literacy of their targeted beneficiaries.

Explained in the background section, we focus on three major streams of funding for the Assisters: Navigator-, IPA, and FQHCA grants. The FQHCA funding comes from the Health Resources and Services Administration (HRSA), which reports total funding amounts by year and state (MAC, 2015). Even though a small portion of the funds are used for extraneous tasks as shown in HRSA's breakdown of funding by program usages, most of the FQHCA funds are implemented to promote education, outreach, and enrollment in the exchanges.

We accumulate the information on the annual Navigator funds as well as the one-time IPA grants from the state health marketplace profiles at Kaiser Family Foundation page.[16] The Navigator funds are distributed annually by the Department of Health and Human Services (HHS), and all states are required by law to maintain the Navigator programs. The IPA funds are one-time funds from state-based marketplaces whose lump sums are given in 2013, before the

[16] See https://www.kff.org/state-health-marketplace-profiles/.

first enrollment period. Unlike the Navigators, IPA programs are recommended but not mandatory, and only state-based exchanges are eligible for IPA funding.[17] States with missing IPA grant information are assumed to have not implemented the program.

The total funding variations that arise across states are not minor and are due to the different levels of generosity of the three funding sources (i.e. Navigator-, IPA-, and FQHCA-grants). The IPA and FQHCA funding programs give grants whose amount matches the budgets proposed by the applicants in the partnership- and state-based exchange states. On the contrary, the Navigator funding's grant amounts tend to be more rigid, strictly based on the population size of each state and a set minimum funding floor. States that are eligible for IPA funding tend to receive greater amounts (i.e. with an average of $95.66 per uninsured in 2014 and 2015) than those that are ineligible (i.e. an average of $54.88 per uninsured in 2014 and 2015). While the Assister funding variations arise due to the types of exchanges available in each state, there is little to no possibility of a reverse causality where the types of exchanges are dictated by the Assister funding amounts: the legislation for the exchanges preceded that of the Assister funding programs—indicating that the chances for the states to choose the type of exchange to embrace based on the Assister funding amounts available in different funding sources.

We sum the amounts of funding granted for Navigators, IPAs, and FQHCA programs by state and year. To proxy the extent to which each potential marketplace enrollee can benefit (i.e. have her insurance literacy increased) from the ACA Assisters, we divide the total funding amount by the number of uninsured individuals per state and year and take a natural log.[18]

[17] For Navigator funding, see 45 CFR § 155.210 at https://www.law.cornell.edu/cfr/text/45/155.210. The IPA funding is also known as the non-Navigator funding. See 45 CRF 155.205 (c), (d), and (e).
[18] Uninsured (nonelderly, below age 65) by state: https://www.kff.org/other/state-indicator/nonelderly-0-64/?currentTimeframe=3&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D. Individual's use of Assister funding is unobserved.

IV. EMPIRICAL APPROACH

We begin with a difference-in-differences (DID) estimation that treats the introduction of the insurance exchanges as an exogenous shock. We compare (1) individuals with ESIs and RHIs through employers (i.e. control), and (2) individuals with ESIs but no RHIs (i.e. treatment), before and after the first open enrollment of the exchanges in 2014.[19] The introduction of the exchanges will affect only our treated individuals because those in the control group already had access to post-retirement health benefits prior to the ACA. The DID specification is not written as it can be inferred from the triple-difference model below.

Next, using a third difference stemming from varying levels of Assistor program funding, we conduct triple-differences (DDD) regressions. For individual *i* in state *s* and year *t*, we estimate,

$$Y_{its} = \beta_0 + \beta_1 1(Treat_{it}) + \beta_2 1(Post_t) + \beta_3 \ln(Literacy_{ts}) + \beta_4 1(Treat_{it}) 1(Post_t) + \beta_5 1(Treat_{it}) \ln(Literacy_{ts}) + \beta_6 1(Post_t) \ln(Literacy_{ts}) + \beta_7 1(Treat_{it}) 1(Post_t) \ln(Literacy_{ts}) + \beta_8 X_{its} + \lambda_i + \gamma_s + \delta_t + \epsilon_{its}\,, \quad (1)$$

where Y_{its} is the planned retirement age for individual *i* living in state *s* at time *t*, and $1(Treat_{it})$ is a binary indicator that equals one if the individual is in the treatment group. $1(Post_t)$ equals one from 2014 onward. The $ln(Literacy_{ts})$ equals the natural log of funding from ACA Assister Programs, which we use a proxy for insurance literacy. X_{its} is a vector of time-variant covariates comprised of demographics and determinants of retirement decisions (e.g., health, income, wealth, pension access and types, access to Social Security income, and access to other health

[19] Aside from access to RHIs, there are no systematic differences between individuals without RHIs (i.e., our treatment group) and those with RHIs (control group). Once an employer decides on an insurance package—which might include RHIs—it is provided unilaterally to all full-time employees. In other words, the employer does not selectively provide RHIs to a subset of employees based on the perceived 'qualities' or 'merits' (Kramer, 2012).

insurance plans. The vector also includes an identifier variable that distinguishes Medicaid-expansion from the non-expansion states so as to avoid potential conflation between the impact of Medicaid expansion and introduction of exchanges. We include state (γ_s), year (δ_t), and individual (λ_i,) fixed-effects so that our remaining variation comes from within an individual-state over time. Of note, the individual fixed effects allow us to control for unobserved preferences that can affect an individual's job choice and retirement decisions. ϵ_{its} is an idiosyncratic error term with mean zero. Standard errors are clustered at the individual level to generate the most conservative estimates. We treat 2014 as the reference year to match the timing of enrollment in the exchanges.[20]

We conduct several robustness checks. First, we perform the DID and DDD regressions without covariates to test for the models' sensitivity. Second, we rerun the regressions with not only the covariates but also an additional variable capturing the state-specific year trends. Third, in lieu of introducing a temporally uniform shock (i.e. the first open enrollment of state-based exchanges) in 2014, we utilize the month-to-month heterogeneity in the timing of legislation for state-based exchanges (discussed in Section II.C and shown in Appendix **Table A1**). Following Stevenson and Wolfers (2006), we use a staggered DDD approach. For each state, we set the reference year equal to the year in which the legislation for the exchange passed. Fourth, we perform non-temporal DID and DDD regressions whereby we replace the $Post_{its}$ variable in eq. (1) with the *generosity* indicator. Lastly, we re-run all models while replacing the planned retirement age outcome with another variable: a self-reported probability (0-100%) of continue working at age 65.

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[20] Since the HRS is conducted biennially, we only have responses for even numbered years.

V. RESULTS

V.A. Assessing Baseline Trends

[Insert Table 2 Here]

Our sample consists of 15,194 person-year observations, spanning over a decade from 2006 to 2016. Summary statistics of the variables used in the analysis are displayed in **Table 2.**[21,22] We use the probability weights to ensure a nationally representative sample.[23] The first two columns display the pooled average of the variables from all pre-exchange years (i.e. 2006-2012) for the treatment- and the control- groups, respectively. The last two columns show the pooled averages from post-exchange years (i.e. 2014-2016). The literacy variable refers to the amount of ACA Assister funding allotted for each uninsured individual—a potential exchange enrollee—by state and year. The generosity variable refers to the maximum extent to which the benchmark premium is subsidized in each state's marketplace.

We follow Imbens and Rubin (2015) in checking for the covariate balance between the control and treatment groups in the pre-treatment years by calculating the normalized differences. Results of the balance testing are also shown in **Table 2**. We account for the imbalance by estimating inverse probability weights to be used for the DID and DDD estimations as an additional robustness check.

[21] Categories for the married are 1. Married/partnered, 2. Divorced/widowed/separated, and 3. Never married. For pension, 1. has DB, 2. has DC, 3. has other private pensions, and 4. has none.

[22] While we have included time-invariant demographic variables in the summary statistics to better show the characteristics of the sample used in our study, the impact of such variables is eliminated in the fixed-effect regressions. Education categories are 0 for those with no degrees, 1 with high-school diploma, 2 with college degrees, 3 with masters, JD, MBA, and 4 with Ph.D. and over. The categories for race is 1 for Caucasians, 2 for African-Americans, and 3 for others.

[23] We use weighted descriptive statistics for sections V-A. However, for the DID and DDD regressions, both unweighted and weighted estimates reveal no substantive difference in terms of the coefficients of interest and its significance. Hence, we present the unweighted results in sections V-C and V-D so as to provide accurate standard errors (Winship and Radbill, 1994).

Next, as one of the key assumptions of the DID and DDD frameworks is common pre-trends between the treatment and control groups, we graphically plot trends in the retirement for the control- and treatment- groups in the pre-exchange years.

[Insert Figure 1 Here]

Shown in **Figure 1**, the parallel trends assumption arguably holds. There is a slight narrowing of the difference between the control and the treatment group in 2010, which could be attributed to the first announcement (i.e. via the passage of the reform law) of the ACA. To reduce the impact of year 2010 from weakening the common trends, we supplement our main analyses by limiting the pre-treatment period to the years (1) before 2010 (i.e. 2006-2008) and (2) after 2010 (i.e. 2010-2014).

We also conduct a formal regression-based test to evaluate the common trends evaluation for a multi-year treatment used by Autor (2003). With four pre-treatment periods and two post-treatment periods, we estimate the following equation,

$$Y_{it} = \alpha + \kappa_k \sum_{k=2006}^{2016} (Year_k)_{it} + \lambda_l \sum_{l=2006}^{2016} (1(Treated) \times Year_l)_{it} + \eta_i + \epsilon_{it}\ , \qquad (2)$$

where Y_{it} is the outcome that is the planned retirement age for individual *i* at wave *t*, and η_i is the individual fixed effects. The lambda coefficients are estimated relative to the reference year (i.e. 2006) and they identify whether there are pre-treatment differences between the treatment- and the control- groups. Standard errors are clustered at the individual level. The results from Equation (2) are shown in **Table 3**.

[Insert Table 3 Here]

The lack of significance associated with the interactions for all remaining pre-treatment years (i.e. 2008-2012) indicate that the outcome-trends between the treatment and the control are not significantly different in the pre-treatment period. Such result further validates the common trends assumption. The formal test also reveals the dynamics of the change in retirement decisions brought upon by the introduction of exchanges (i.e. how fast the effect unravels). While the exchange was mandated to open by the end of March 2014, temporal changes in retirement did not begin in 2014, but rather occurred in our subsequent year of available data (2016). The lack of significance associated with the interaction term for 2014 suggests that there was a lag in adjustments to planned retirement.

V.B. Relationship between the Insurance Literacy and Insurance Uptake

The key intermediary factor between insurance literacy and modifications of retirement decisions is changes in *insurance uptake*. As discussed in section II-B, by theory, a rise in the insurance literacy can lead to both a rise and a fall of insurance uptake. Using empirical data, we show that there is a net positive association between the two elements.

In **Figure 2**, we highlight the state-specific heterogeneity in Assister funding (i.e., our measure of insurance literacy) and associated insurance enrollment into the insurance exchanges. Plot (a) of Figure 2 indicates that in 2014-2016, California, Florida, and Texas having the highest levels of funding and Hawaii, North Dakota, and District of Columbia having the lowest level of funding, on average. Plot (b) shows that between 2014 and 2016, enrollment into the exchanges also varied substantially across states. For further clarification, we plot the relationship between the Assister funding and the insurance uptake in **Figure 3**. The fitted line has a statistically significant slope of 0.0041, suggesting that there is a positive correlation between funding levels and insurance uptake. These figures provide suggestive evidence that funding to increase insurance literacy is positively associated with enrollment, lending empirical evidence that the low-literacy individuals are more likely to under-enroll (due to the increased uncertainty) rather than over-enroll (due to an over-estimation of health risks). We provide more rigorous evidence of this conjecture in the subsequent DDD estimations.

[Insert Figure 2 Here]

[Insert Figure 3 Here]

V.C. Impact of the Exchanges on Planned Retirement

The main results from our DID regression are summarized in **Table 4**. We provide estimates of the detailed covariates in Appendix **Table A2**. Across all DID analyses, we find that the introduction of the exchanges in ACA is associated with faster timing of expected retirement. The main analysis in column (1) shows that, compared to workers with both ESIs and RHIs through employers, those without RHIs (i.e. treatment group) accelerate retirement by 0.31 years with the opening of exchanges in ACA, demonstrating that the treatment group workers are significantly influenced by the new opportunities for accessing the post-retirement insurance made available via the exchanges. This result is statistically significant at 5% level, and the estimate is robust to controlling for covariates (column (2)), our preferred specification. They are also robust to the inclusion of state-specific year trends (column (3)).

[Insert Table 4 Here]

Our various robustness checks, shown in columns (4)-(8), also display consistent results.[24] When we replace the temporal difference with the level of generosity (i.e., the monthly premium for the second-lowest silver plan as explained in Section III-A), the estimated coefficient for the non-temporal DID in column (4) suggests that a one percentage point increase in the level of generosity of the exchange subsidy is associated with an acceleration of (expected) timing of retirement of the treatment group by 0.52 years. The results show that insurance uptake, as well as the subsequent adjustments in retirement decisions, depend not only on the opening of the insurance exchanges but also—and perhaps more so—on the generosity of the plan premiums and subsidies available at the exchanges.

Restricting the pre-treatment years to 2006 to 2008 in column (5) or 2010 to 2014 in column (6) portray a similar picture, suggesting that our results are not affected by the inclusion of the ACA announcement. Finally, we examine an alternative planned retirement outcome (i.e., probability of continue working at age 65) in column (8). The results indicate that the treatment group decreases their probability of working at age 65 by 4.83 percent from the mean of 40.8 percent (i.e. a decrease of 1.97 percentage points) with the introduction of state exchanges. Lastly, the weighted DID using inverse probability weights (IPW) in column (9) shows, with a significance at the 5% level, that those in the treatment group accelerate retirement by 0.30 years. All of the estimated DID-coefficients are in line with the job-lock theory which postulates that ACA will have a job-lock removing effect by increasing people's access to post-retirement insurance.

[24] All robustness checks are done to the main analysis specification that includes all covariates as in column (2).

V.D. The Role of Insurance Literacy on Planned Retirement

Table 5 displays the key coefficients from various triple-differences models, with detailed results shown in Appendix **Table A3**. Here, the coefficients of interest are associated with the triple differences: 1(Post) x 1(Treated) x ln(literacy). Based on the main analysis in column (1), a one-percent increase in insurance literacy (i.e., measured by the ACA Assister's financial support per uninsured person) increases the effect of the ACA on early retirement for the treated group by 0.36 years. The finding is robust to adding covariates in column (2), which increases the statistical significance of the triple difference, and it is also robust to the inclusion of state-specific year trends as is shown in column (3). Restricting the pre-treatment years in column (5) and (6) portray a similar story. [25]

[Insert Table 5 Here]

When we re-estimate Equation (1) to account for the generosity of premium subsidies available in each exchange, we find an even stronger, additive effect of insurance literacy funding (column (4)). A one-percent increase in literacy funding among those in the treatment group accelerates retirement by 0.71 years. The staggered DDD regression in column (7) and our examination of the expected 'probability of working at age 65' in column (8) generate consistent results in terms of how increased insurance literacy affects the retirement responses to the exchanges: a one percent increase in literacy funding among those in the treatment group further accelerates retirement by 0.014 years, and it decreases the probability of working at age 65 by 1.65 percent (i.e. a decrease of 0.671 percentage points from a mean of 40.76), respectively. A similar picture is portrayed in the IPW-weighted DDD in column (9) which shows that those in

[25] All robustness checks are done to the main analysis specification that includes all covariates as in column (2).

the treatment group accelerate retirement by 0.43 years. However, the DDD coefficients in columns (7) and (8) lack significance, possibly because of the relatively short time lapse that hampers precision.

VI. CONCLUSION

The introduction of the insurance marketplace in ACA has made individual insurance plans more accessible and affordable, particularly to those without jobs or insurance-sponsoring employers. In theory, individuals who had access to ESI but not RHIs prior to ACA could be freed from the ESI-induced job-lock through the option of purchasing individual plans from the exchanges.

Although our study covers only two years since the introduction of exchanges and three years since the injection of the major ACA Assister grants, we find empirical evidence of that the exchanges did remove the job-lock effects. Our DID results show that, compared to those who had both ESIs and RHIs through employers, those without the employer-sponsored RHIs are more significantly influenced by the introduction of the exchanges in ACA, hastening their expected timing of retirement by 0.31 years. With additional years of data added to the analytic period in the future, we may be able to strengthen our estimates of ACA's impact on workers' actual (as opposed to planned) retirement decisions.

Additionally, we find that insurance literacy, and hence the extent to which individuals understand the ACA-induced policy changes, play an important role in determining the exchange's impact on retirement plans. Using state-specific variation in ACA Assister Funding per capita uninsured, we show that individuals with greater access to Assister funding exhibited the largest changes in retirement decisions post-ACA. These results suggest that increased insurance literacy leads to a better understanding of insurance enrollment opportunities via the exchanges, a higher likelihood of insurance uptakes, and a further modification of subsequent work and retirement decisions. Our results highlight the importance of promoting health- and health insurance literacy to enhance the efficacy of the healthcare reforms.

Given the strong linkage between insurance and employment in the US, the impacts of ACA on the extent of job-lock and other labor supply behaviors deserve attention. From an economic perspective, the removal of the job-lock is welfare improving. When a worker is locked in her job due to her inability to obtain the RHI, an employer—knowing that this employee will not retire due to her high valuation of ESI—can extract surplus from the employee and/or discriminate in wages. In this sense, the job-lock thus can generate a loss of welfare. The misallocation of workers to firms can also result in decreased worker productivity, the retaining of sicker employees, and reductions in entrepreneurship and innovation. Our results suggest that the ACA reduced some of these inefficiencies.

However, from the policy perspective, the accelerated retirement can introduce a negative side-effect: the accelerated retirement counteracting other policy efforts to foster longer working lives, a commonly proposed strategy to combat the problems of population aging and a rapidly shrinking tax base of the nation (Maestas and Zissimopoulos, 2010).[26] It is unclear whether the welfare gains from reduced job-lock dominate the societal loss of early retirement, and future research can assess the relative trade-offs of these effects..

This study provides timely insights to the current policy discourse on the possible consequences of a dramatic reduction in the ACA Assister grants: starting in 2017, the Centers

[26] The past efforts include the increase in the Social Security eligibility age, the termination of the Social Security earnings test, a repeal of the mandatory retirement, etc. (Gustman et al., 2016).

for Medicare and Medicaid Services announced that there has been a reduction in the total ACA Assister funding by 43%—from $52.9 million in 2016 to $36.1 million in 2017. A subsequent reduction followed in July 2018, which allocated just $10 million to Assister grants.[27] While it is certainly possible that added funding will yield diminishing marginal returns, the marginal benefits of funding should be assessed based on not only improved insurance enrollment, but also its spillover effects on the labor market.

[27] See https://www.kff.org/health-reform/issue-brief/data-note-further-reductions-in-navigator-funding-for-federal-marketplace-states/.

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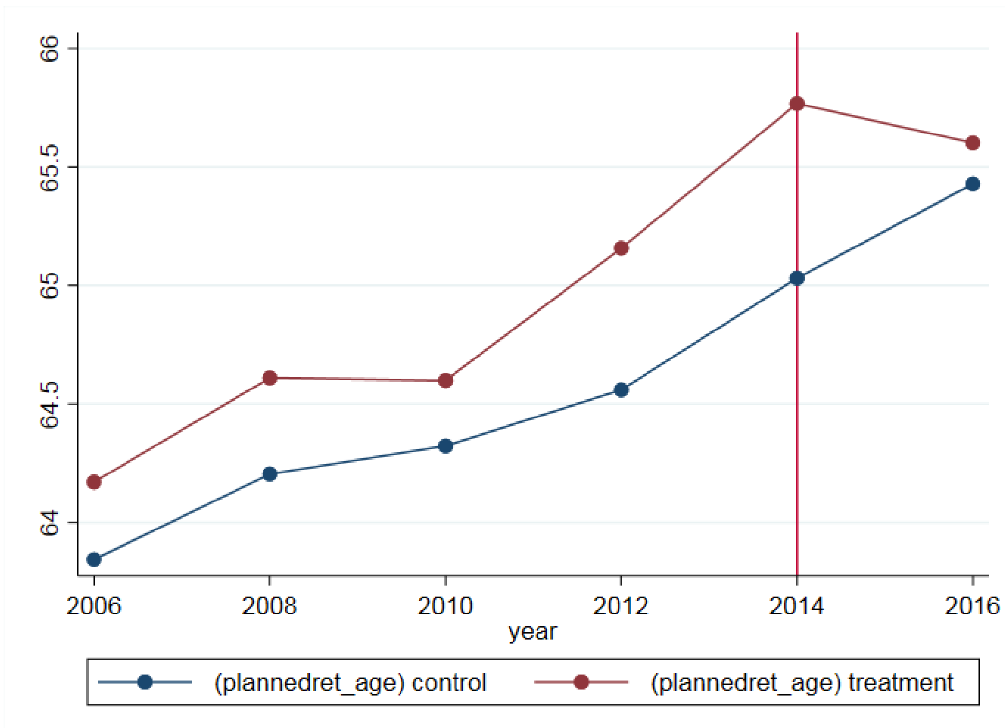
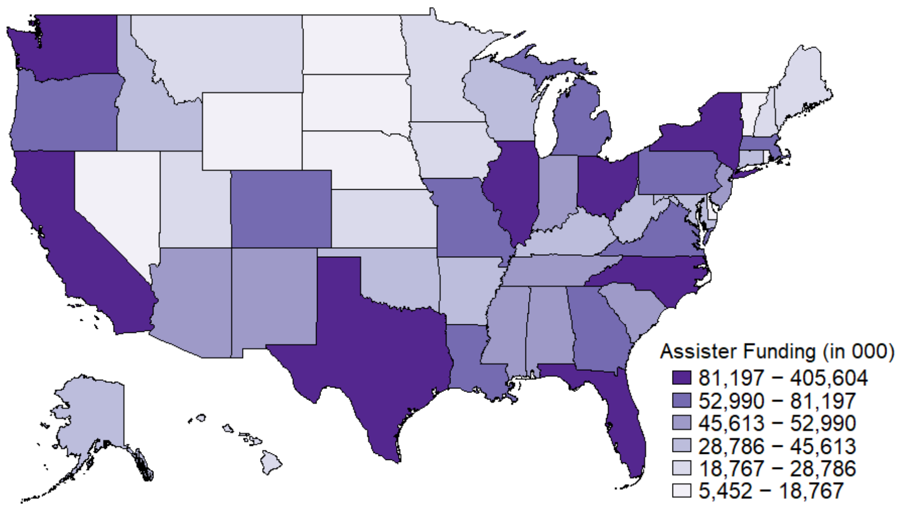
Figure 1. Trends in Planned Retirement



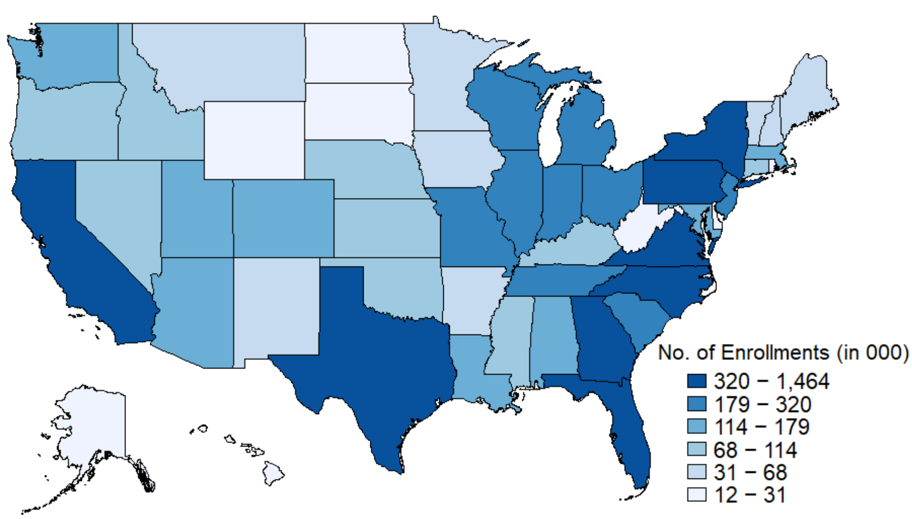
Source: Author’s calculations based on the HRS.

Figure 2. Correlations between the Amount of Assister Funding Available in Each State and the Total Number of Enrollments in Exchanges

(a) ACA Assister Funding

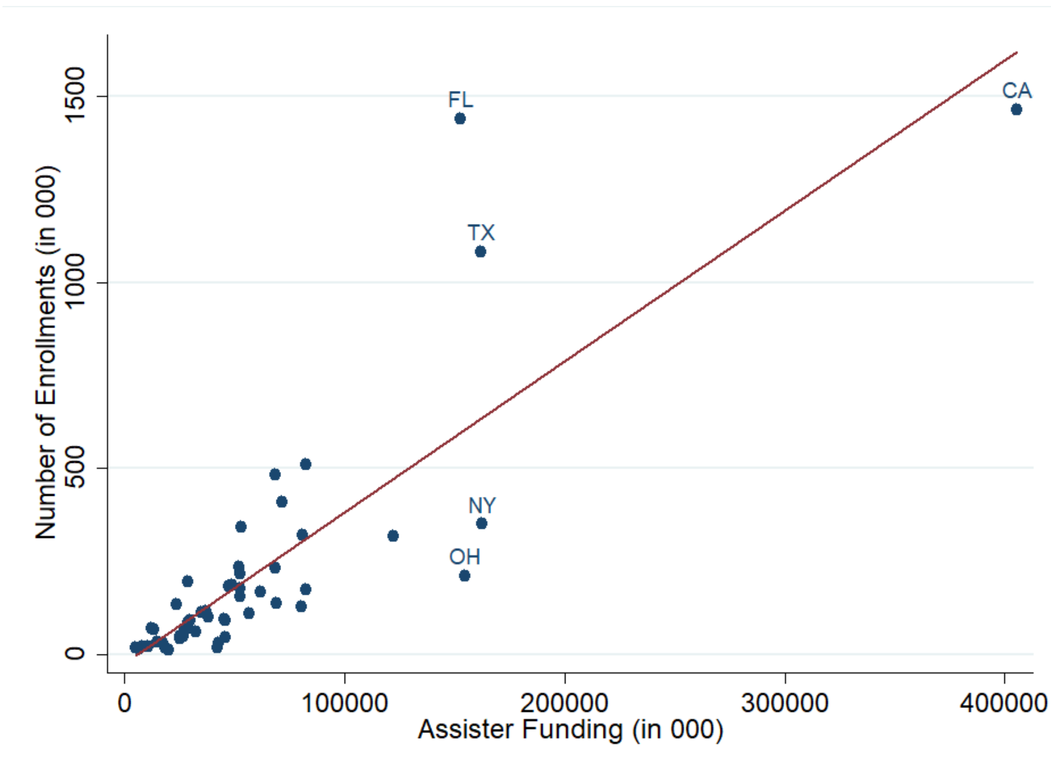


(b) Enrollment in Insurance Exchanges



Source: Author's calculations using KFF's state indicators of marketplace enrollments and information on the Assister funding allotted per uninsured person. Both figures are drawn from 2016 data.

Figure 3. Relationship between the Assister Funding and the Exchange Enrollments



Source: Author's calculations using KFF's state indicators of marketplace enrollment and total Assister funding information between years 2014-2016. The fitted line is given by the equation 'number of enrollment= -25.84+0.0041*assister funding.'

Table 1. Types of Exchange and Assister Grants

Exchange Type	Assister Funding Type
State-based exchange	IPA, FQHCA
State-federal partnership exchange	Navigator, IPA, FQHCA
Federally-facilitated exchange	Navigator, FQHCA

Source: Information obtained from https://www.medicaid.gov/state-resource-center/mac-learning-collaboratives/downloads/cnsmr-asstnce-mktplce.pdf.

Table 2. Summary Statistics and Baseline Characteristics

	(1) Treatment ESI + No RHI pre-2014	(2) Control ESI + RHI pre-2014	norm diff >0.5	(3) Treatment ESI + No RHI post-2014	(4) Control ESI + RHI post-2014
planned retirement age	65.962	65.204	+	66.322	66.196
probability of working at age 65	50.844	45.693	+	49.862	50.671
post	0	0		1	1
treatment	1	0		1	0
literacy	35.871	11.679		88.058	93.208
generosity	0	0		0.472	0.447
age	58.425	59.020	+	59.213	60.038
educ*	1.541	1.506	+	1.387	1.507
male*	0.630	0.574	+	0.595	0.607
race*	1.367	1.426		1.453	1.384
married	1.532	1.554		1.548	1.501
pension	3.204	2.763	+	3.133	2.713
income	36607.807	61981.783		39575.936	61425.700
wealth	122703.691	128105.408		94368.989	59818.514
health status (standardized)	0.855	0.854		0.780	0.787
access to other insurance	0.849	0.801		0.753	0.795
access to Social Security income	0.007	0.015		0.068	0.064
living in Medicaid expansion states	0.527	0.613	+	0.606	0.558

Source: Author's calculations based on the HRS data.

Notes: The summary statistics show the averages from pooled cross-sections weighted by probability weights. As we conduct fixed-effect regressions in this paper, eliminated are these time-invariant variables (*). We conducted tests for covariate balance during the pre-treatment years using normalized differences between columns (1) and (2). + indicates differences greater than 0.5.

Table 3. Evaluating Pre-Treatment Trends

treated=1	0.311
	(0.205)
YEAR	
year=2008	0.546***
	(0.099)
year=2010	1.281***
	(0.132)
year=2012	1.666***
year=2014	2.215***
	(0.154)
year=2016	2.755***
	(0.185)
TREATED x YEAR	
treated=1 x year=2008	-0.187
	(0.182)
treated=1 x year=2010	-0.188
	(0.213)
treated=1 x year=2012	-0.070
	(0.225)
treated=1 x year=2014	-0.228
	(0.236)
treated=1 x year=2016	-0.854***
	(0.284)
Constant	63.304***
	(0.127)
Observations	15194
Adjusted R-squared	0.055

*Standard errors in parentheses * p<0.1 ** p<0.05 *** p<0.01*

Note: Data are adjusted for individual fixed effects. Standard errors are clustered at the individual level. 2006 is the reference year.

Source: Author's calculation using HRS.

Table 4. Impact of Introduction of Exchanges on Planned Retirement: Difference-in-Differences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		main analysis		level of generosity in lieu of 1(post)	pre-treatment (2006-2008)	pre-treatment (2010-2014)	staggered DID	Y= prob. of working at 65	ipw-weighted
1(post)	1.027***	1.193	§	-0.169	§	§	0.093	19.324	1.810
	(0.097)	(1.949)	(.)	(0.673)	(.)	(.)	(0.150)	(15.451)	(2.149)
1(treated)	-0.146	0.155	0.175	0.137	-0.161	0.178	0.079	-0.356	0.090
	(0.137)	(0.137)	(0.138)	(0.137)	(0.263)	(0.177)	(0.150)	(1.127)	(0.147)
1(post) x 1(treated)	-0.309**	-0.306**	-0.301**	-0.521*	0.159	-0.358**	-0.027	-1.970*	-0.304**
	(0.142)	(0.140)	(0.142)	(0.291)	(0.327)	(0.141)	(0.142)	(1.138)	(0.152)
covariates?	N	Y	Y	Y	Y	Y	Y	Y	Y
state-specific year trends?	N	N	Y	N	N	N	N	N	N
dependent variable mean	64.886	64.886	64.886	64.886	64.935	65.105	64.886	40.761	64.814
observations	15194	15194	15194	15194	8971	10943	15194	15194	15194
adjusted R-squared	0.023	0.060	0.063	0.059	0.093	0.030	0.059	0.020	0.061

*Standard errors in parentheses   * p<0.1   ** p<0.05   *** p<0.01*

Note: Except for column (8), the outcome variable is the planned retirement age. Data are adjusted for state-, year-, and individual fixed effects. Standard errors are clustered at the individual level. A possible confounding by the Medicaid expansion has been accounted for by adding the expansion identifier as a control. We observe retirement around 2014 when all states had their first open enrollments except in column (7). For covariates and state-specific year trends, "Y" indicates their being controlled while "N" indicates otherwise. Cells with § are omitted due to collinearity.

Source: Author's calculation using HRS.

Table 5. Impact of Introduction of Exchanges on Planned Retirement: Triple-Differences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		main analysis		level of generosity in lieu of 1(post)	pre-treatment (2006-2008)	pre-treatment (2010-2014)	staggered DDD	Y= prob. of working at 65	ipw-weighted
1(post)	-0.866	§	§	-2.846*	§	§	-0.031	§	0.035
	(0.597)	(.)	(.)	(1.635)	(.)	(.)	(0.179)	(.)	(2.380)
1(treated)	0.110	0.209	0.235	0.175	2.819**	0.213	0.079	-0.931	0.169
	(0.144)	(0.145)	(0.147)	(0.146)	(1.210)	(0.177)	(0.216)	(1.179)	(0.155)
ln(literacy)	0.051***	0.017*	0.019**	0.018**	0.008	0.013	0.024**	0.239***	0.017*
	(0.006)	(0.009)	(0.009)	(0.009)	(0.184)	(0.011)	(0.011)	(0.077)	(0.010)
1(post) x 1(treated)	1.222	1.437	1.599*	2.573	§	1.270	0.020	1.754	1.494
	(0.883)	(0.875)	(0.887)	(1.857)	(.)	(0.863)	(0.221)	(7.431)	(0.958)
1(post) x ln(literacy)	0.344**	0.304*	0.326	0.626*	0.444	0.299*	-0.001	1.066	0.292
	(0.137)	(0.168)	(0.205)	(0.347)	(0.420)	(0.167)	(0.019)	(1.426)	(0.182)
1(treated) x ln(literacy)	0.006	0.009	0.010	0.006	0.215**	0.016	0.001	-0.088	0.013
	(0.009)	(0.009)	(0.009)	(0.009)	(0.087)	(0.010)	(0.015)	(0.073)	(0.009)
1(post) x 1(treated) x ln(literac	-0.357*	-0.413**	-0.451**	-0.731*	-0.857**	-0.392*	-0.014	-0.671	-0.434*
	(0.205)	(0.203)	(0.206)	(0.437)	(0.355)	(0.200)	(0.026)	(1.694)	(0.223)
covariates?	N	Y	Y	Y	Y	Y	Y	Y	Y
state-specific year trends?	N	N	Y	N	N	N	N	N	N
dependent variable mean	64.886	64.886	64.886	64.886	64.935	65.105	64.886	40.761	64.814
observations	15194	15194	15194	15194	8971	10943	15194	15194	15194
adjusted R-squared	0.041	0.061	0.065	0.060	0.095	0.032	0.059	0.021	0.063

*Standard errors in parentheses * p<0.1 ** p<0.05 *** p<0.01*

Note: Except for column (8), the outcome variable is the planned retirement age. Data are adjusted for state-, year-, and individual fixed effects. Standard errors are clustered at the individual level. A possible confounding by the Medicaid expansion has been accounted for by adding the expansion identifier as a control. We observe retirement around 2014 when all states had first open enrollments except in column (7). For covariates and state-specific year trends, "Y" indicates their being controlled while "N" indicates otherwise. Cells with § are omitted due to collinearity.

Source: Author's calculation using HRS.

Table A1. ACA Assister Program Regulations by State

States	Marketplace Types	Legislation Dates	Medicaid Exp.*
Alabama	Federally-facilitated Marketplace	Official Announcement in Nov 2011	Not Adopted
Alaska	Federally-facilitated Marketplace	Official Announcement in July 2012	Adopted
Arizona	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Adopted
Arkansas	State-based Marketplace	HB1508 in April 2013	Adopted
California	State-based Marketplace	AB1602, SB900 in Sept 2010	Adopted
Colorado	State-based Marketplace	SB11-200 in June 2011	Adopted
Connecticut	State-based Marketplace	SB921, PA11-53 in July 2011	Adopted
Delaware	State-Partnership Marketplace	Official Announcement in July 2013	Adopted
District of Columbia	State-based Marketplace	Act 19-269 in Jan 2012	Adopted
Florida	Federally-facilitated Marketplace	Official Announcement in Dec 2012	Not Adopted
Georgia	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Not Adopted
Hawaii	Federally-facilitated Marketplace	SB1348 in July 2011	Adopted
Idaho	State-based Marketplace	HB248 in March 2013	Considering Exp.
Illinois	State-Partnership Marketplace	SB 1555 in 2011	Adopted
Indiana	Federally-facilitated Marketplace	Exec. Order 11-01 in late 2011	Adopted
Iowa	State-Partnership Marketplace	Official Announcement in Dec 2012	Adopted
Kansas	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Not Adopted
Kentucky	State-based Marketplace	Order 578 in July 2012	Adopted
Louisiana	Federally-facilitated Marketplace	Official Announcement in 2012	Adopted
Maine	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Adopted
Maryland	State-based Marketplace	SB 192, HB166 in April 2011	Adopted
Massachusetts	State-based Marketplace	Healthcare Reform in 2006	Adopted
Michigan	State-Partnership Marketplace	Official Announcement in March 2013	Adopted
Minnesota	State-based Marketplace	SF 1 in March 2013	Adopted
Mississippi	Federally-facilitated Marketplace	Official Announcement in Oct 2011	Not Adopted
Missouri	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Not Adopted
Montana	Federally-facilitated Marketplace	Official Announcement in Dec 2012	Adopted
Nebraska	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Considering Exp.
Nevada	State-based Marketplace	SB440 in June 2011	Adopted
New Hampshire	State-Partnership Marketplace	Official Announcement in March 2013	Adopted
New Jersey	Federally-facilitated Marketplace	Official Announcement in Dec 2012	Adopted
New Mexico	State-based Marketplace	CFDA 93-525 in March 2013	Adopted
New York	State-based Marketplace	Exec. Order 42 in April 2012	Adopted
North Carolina	Federally-facilitated Marketplace	HB126, HB115, SB418 in 2011	Not Adopted
North Dakota	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Adopted
Ohio	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Adopted
Oklahoma	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Not Adopted
Oregon	State-based Marketplace	SB99 in June 2011	Adopted
Pennsylvania	Federally-facilitated Marketplace	Official Announcement in Dec 2012	Adopted
Rhode Island	State-based Marketplace	Exec. Order 11-09 in Sept. 2011	Adopted
South Carolina	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Not Adopted
South Dakota	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Not Adopted
Tennessee	Federally-facilitated Marketplace	Official Announcement in Dec 2012	Not Adopted
Texas	Federally-facilitated Marketplace	Official Announcement in July 2012	Not Adopted
Utah	Federally-facilitated Marketplace	Official Announcement in May 2013	Considering Exp.
Vermont	State-based Marketplace	HB202 in May 2011	Adopted
Virginia	Federally-facilitated Marketplace	Official Announcement in Dec 2012	Adopted
Washington	State-based Marketplace	SB5445 in May 2011	Adopted
West Virginia	State-Partnership Marketplace	SB408 in Feb 2013	Adopted
Wisconsin	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Not Adopted
Wyoming	Federally-facilitated Marketplace	Official Announcement in Nov 2012	Not Adopted

Source: Data compiled through reviewing Marketplace documents and communication between the states and CCIIO by KFF.

Table A2. Impact of Introduction of Exchanges on Planned Retirement: Difference-in-Differences, Detailed

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	main analysis			robustness checks, with cov					
Y=planned retirement age	without cov	with cov	with cov, state-specific year trends	generosity in lieu of 1(post)	pre-treatment (2006-2008)	pre-treatment (2010-2014)	staggered DID	Y= prob. of working at 65	ipw-weighted
1(post)	1.027***	1.193	§	-0.169	§	§	0.093	19.324	1.810
	(0.097)	(1.949)	(.)	(0.673)	(.)	(.)	(0.150)	(15.451)	(2.149)
1(treated)	-0.146	0.155	0.175	0.137	-0.161	0.178	0.079	-0.356	0.090
	(0.137)	(0.137)	(0.138)	(0.137)	(0.263)	(0.177)	(0.150)	(1.127)	(0.147)
1(post) x 1(treated)	-0.309**	-0.306**	-0.301**	-0.521*	0.159	-0.358**	-0.027	-1.970*	-0.304**
	(0.142)	(0.140)	(0.142)	(0.291)	(0.327)	(0.141)	(0.142)	(1.138)	(0.152)
age	-	0.124	0.136	0.123	0.017	0.154	0.122	-0.765	0.066
	-	(0.202)	(0.201)	(0.203)	(0.219)	(0.200)	(0.203)	(1.591)	(0.223)
marital status (ref=1.married)									
2. div/wid/sep	-	0.271	0.271	0.275	0.405	0.370*	0.278	2.836	0.183
	-	(0.189)	(0.187)	(0.189)	(0.330)	(0.224)	(0.189)	(1.840)	(0.196)
3. never married	-	0.699	0.680	0.717	1.883	1.154*	0.740	-1.813	0.893
	-	(0.550)	(0.552)	(0.553)	(1.545)	(0.608)	(0.553)	(4.010)	(0.589)
pension access (ref=4.none)									
1. defined-benefit	-	-0.177	-0.176	-0.178	0.021	-0.330**	-0.177	-0.221	-0.195
	-	(0.116)	(0.115)	(0.116)	(0.206)	(0.149)	(0.116)	(1.028)	(0.124)
2. defined-contribution	-	-0.045	-0.049	-0.044	-0.058	-0.084	-0.044	-0.569	-0.135
	-	(0.088)	(0.088)	(0.088)	(0.166)	(0.106)	(0.088)	(0.696)	(0.099)
3. other	-	0.189	0.187	0.191	0.447	0.251	0.192	-2.293	0.049
	-	(0.194)	(0.194)	(0.194)	(0.422)	(0.220)	(0.194)	(1.545)	(0.208)
ln(income)	-	0.004	0.003	0.004	0.014	0.005	0.003	0.081*	0.003
	-	(0.006)	(0.006)	(0.006)	(0.011)	(0.008)	(0.006)	(0.047)	(0.007)
ln(wealth)	-	0.008	0.009	0.008	0.008	0.009	0.008	0.002	0.008
	-	(0.008)	(0.008)	(0.008)	(0.014)	(0.011)	(0.008)	(0.066)	(0.009)
health	-	0.362**	0.337**	0.362**	0.139	0.484***	0.365**	2.485**	0.411***
	-	(0.142)	(0.140)	(0.142)	(0.233)	(0.183)	(0.142)	(1.228)	(0.155)
no. of dependents	-	-0.012	-0.014	-0.013	-0.008	-0.009	-0.012	-0.369*	-0.014
	-	(0.011)	(0.011)	(0.011)	(0.017)	(0.009)	(0.010)	(0.220)	(0.016)
access to other insurance	-	-0.116	-0.107	-0.112	-0.274	-0.166	-0.109	-2.105	-0.176
	-	(0.237)	(0.236)	(0.236)	(0.393)	(0.301)	(0.236)	(1.880)	(0.271)
access to Social Security income	-	1.406***	1.427***	1.409***	0.972**	1.005***	1.404***	-5.371**	1.380***
	-	(0.297)	(0.302)	(0.298)	(0.468)	(0.348)	(0.297)	(2.138)	(0.302)
Medicaid expansion	-	6.791***	-813.065**	6.791***	-11.069***	-0.368	4.707**	53.397*	5.165**
	-	(2.331)	(384.088)	(2.321)	(3.024)	(0.816)	(1.925)	(29.339)	(2.040)
constant	64.689***	57.777***	-17.895	57.857***	63.630***	51.452***	57.984***	58.612	60.443***
	(0.073)	(10.672)	(404.070)	(10.676)	(11.678)	(11.056)	(10.694)	(83.704)	(11.715)
dependent variable mean	64.886	64.886	64.886	64.886	64.935	65.105	64.886	40.761	64.814
observations	15194	15194	15194	15194	8971	10943	15194	15194	15194
adjusted R-squared	0.023	0.060	0.063	0.059	0.093	0.030	0.059	0.020	0.061

*Standard errors in parentheses * p<0.1 ** p<0.05 *** p<0.01*

Note: Data are adjusted for state-, year-, and individual fixed effects. Standard errors are clustered at the individual level. A possible confounding by the Medicaid expansion has been accounted for by adding the expansion identifier as a control. We observe retirement around 2014 when all states had their first open enrollments except in column (7). Cells with § are omitted due to collinearity.

Source: Author's calculation using HRS.

Table A3. Impact of Introduction of Exchanges on Planned Retirement: Triple-Differences, Detailed

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	main analysis			robustness checks, with cov					
Y=planned retirement age	without cov	with cov	with cov, state-specific year trends	generosity in lieu of 1(post)	pre-treatment (2006-2008)	pre-treatment (2010-2014)	staggered DID	Y= prob. of working at 65	ipw-weighted
1(post)	-0.866	§	§	-2.846*	§	§	-0.031	§	0.035
	(0.597)	(.)	(.)	(1.635)	(.)	(.)	(0.179)	(.)	(2.380)
1(treated)	0.110	0.209	0.235	0.175	2.819**	0.213	0.079	-0.931	0.169
	(0.144)	(0.145)	(0.147)	(0.146)	(1.210)	(0.177)	(0.216)	(1.179)	(0.155)
ln(literacy)	0.051***	0.017*	0.019**	0.018**	0.008	0.013	0.024**	0.239***	0.017*
	(0.006)	(0.009)	(0.009)	(0.009)	(0.184)	(0.011)	(0.011)	(0.077)	(0.010)
1(post) x 1(treated)	1.222	1.437	1.599*	2.573	§	1.270	0.020	1.754	1.494
	(0.883)	(0.875)	(0.887)	(1.857)	(.)	(0.863)	(0.221)	(7.431)	(0.958)
1(post) x ln(literacy)	0.344**	0.304*	0.326	0.626*	0.444	0.299*	-0.001	1.066	0.292
	(0.137)	(0.168)	(0.205)	(0.347)	(0.420)	(0.167)	(0.019)	(1.426)	(0.182)
1(treated) x ln(literacy)	0.006	0.009	0.010	0.006	0.215**	0.016	0.001	-0.088	0.013
	(0.009)	(0.009)	(0.009)	(0.009)	(0.087)	(0.010)	(0.015)	(0.073)	(0.009)
1(post) x 1(treated) x ln(literacy)	-0.357*	-0.413**	-0.451**	-0.731*	-0.857**	-0.392*	-0.014	-0.671	-0.434*
	(0.205)	(0.203)	(0.206)	(0.437)	(0.355)	(0.200)	(0.026)	(1.694)	(0.223)
age	-	0.130	0.146	0.124	0.024	0.159	0.127	-0.735	0.075
	-	(0.202)	(0.201)	(0.202)	(0.218)	(0.200)	(0.203)	(1.591)	(0.223)
marital status (ref=1.married)									
2. div/wid/sep	-	0.266	0.271	0.270	0.394	0.373*	0.274	2.769	0.183
	-	(0.189)	(0.187)	(0.189)	(0.328)	(0.224)	(0.189)	(1.835)	(0.196)
3. never married	-	0.688	0.671	0.703	1.836	1.145*	0.728	-1.898	0.872
	-	(0.549)	(0.551)	(0.552)	(1.539)	(0.607)	(0.555)	(4.017)	(0.590)
pension access (ref=4.none)									
1. defined-benefit	-	-0.184	-0.185	-0.183	0.014	-0.343**	-0.177	-0.203	-0.200
	-	(0.116)	(0.116)	(0.116)	(0.206)	(0.149)	(0.116)	(1.027)	(0.125)
2. defined-contribution	-	-0.042	-0.045	-0.042	-0.062	-0.083	-0.040	-0.536	-0.127
	-	(0.088)	(0.088)	(0.088)	(0.167)	(0.106)	(0.088)	(0.695)	(0.099)
3. other	-	0.176	0.173	0.180	0.434	0.227	0.188	-2.358	0.040
	-	(0.194)	(0.194)	(0.194)	(0.421)	(0.220)	(0.194)	(1.540)	(0.208)
ln(income)	-	0.003	0.003	0.003	0.014	0.004	0.003	0.077	0.002
	-	(0.006)	(0.006)	(0.006)	(0.011)	(0.008)	(0.006)	(0.047)	(0.007)
ln(wealth)	-	0.008	0.009	0.008	0.008	0.010	0.008	0.005	0.009
	-	(0.008)	(0.008)	(0.008)	(0.014)	(0.011)	(0.008)	(0.066)	(0.009)
health	-	0.363**	0.340**	0.361**	0.136	0.483***	0.367***	2.473**	0.417***
	-	(0.142)	(0.140)	(0.142)	(0.233)	(0.182)	(0.142)	(1.227)	(0.156)
no. of dependents	-	-0.010	-0.012	-0.012	-0.004	-0.007	-0.011	-0.362	-0.011
	-	(0.011)	(0.011)	(0.011)	(0.018)	(0.009)	(0.011)	(0.220)	(0.016)
access to other insurance	-	-0.102	-0.092	-0.098	-0.269	-0.148	-0.104	-2.109	-0.160
	-	(0.236)	(0.236)	(0.236)	(0.391)	(0.301)	(0.237)	(1.883)	(0.271)
access to Social Security income	-	1.394***	1.414***	1.395***	0.977**	0.983***	1.386***	-5.505**	1.366***
	-	(0.299)	(0.304)	(0.300)	(0.470)	(0.350)	(0.298)	(2.144)	(0.305)
Medicaid expansion	-	5.142***	-795.277**	6.812***	-11.201***	-2.415	6.867***	58.000***	7.633***
	-	(1.985)	(379.852)	(2.319)	(3.038)	(2.789)	(2.316)	(15.017)	(2.585)
constant	64.875***	57.836***	373.015	58.107***	63.289***	51.747***	57.984***	60.337	60.215***
	(0.077)	(10.677)	(454.417)	(10.672)	(13.827)	(11.073)	(10.695)	(83.685)	(11.732)
dependent variable mean	64.886	64.886	64.886	64.886	64.935	65.105	64.886	40.761	64.814
observations	15194	15194	15194	15194	8971	10943	15194	15194	15194
Adjusted R-squared	0.041	0.061	0.065	0.060	0.095	0.032	0.059	0.021	0.063

*Standard errors in parentheses * p<0.1 ** p<0.05 *** p<0.01*

Note: Data are adjusted for state-, year-, and individual fixed effects. Standard errors are clustered at the individual level. A possible confounding by the Medicaid expansion has been accounted for by adding the expansion identifier as a control. We observe retirement around 2014 when all states had first open enrollments except in column (7). Cells with § are omitted due to collinearity.

Source: Author's calculation using HRS.