Early Impact of the Affordable Care Act on Social Security Disability Insurance Benefits[*]

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Abstract

We explore spillovers between social programs providing health insurance to low income populations under the Affordable Care Act (ACA) and the Social Security Disability Insurance (DI) program, which provides health insurance and cash benefits to disabled workers. The effect of the ACA on DI benefits is theoretically ambiguous. While subsidized insurance may decrease reliance on DI by providing an alternative avenue for health insurance for those who would otherwise lack health insurance, the ACA may *increase* DI applications among those who otherwise rely on employer-sponsored insurance (ESI) by reducing the cost of DI's two-year waiting period for Medicare. The empirical literature on the effects of the ACA has thus far been hampered by lack of data allowing researchers to identify individuals with and without ESI who would benefit differentially from the Medicaid expansion and Marketplace subsidies. We use a novel data set of the universe of U.S. tax records spanning 2007-2016 to overcome these limitations. We implement two research designs. First, we estimate the effect of the Medicaid expansions on the share of new DI beneficiaries with family income under 100% of the Federal Poverty Level (FPL) and are unable to detect a statistically significant effect. Second, we estimate the effect of low vs. high Marketplace subsidies on the share of new DI beneficiaries with family income between 138 and 400% FPL and find some evidence consistent with larger subsidies increasing DI claiming among those with prior access to ESI and decreasing DI claiming among those without prior access to ESI.

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Introduction

As a result of the largest expansion in public subsidies for health insurance for the under 65 aged population since the inception of Medicaid, the Affordable Care Act (ACA) is thought to have reduced the uninsured population by about 12.8 million (Carrasquillo and Mueller 2018), while potentially changing the price of coverage for millions more. New subsidies for health insurance may affect participation in several existing public programs that also provided health insurance to beneficiaries, as there is often an overlap between potential target populations when new social programs commence. This is especially true for non-elderly adults with disabilities, given their high demand for health insurance, their high likelihood of qualifying for disability insurance programs due to work-limiting health conditions, and their qualifying for ACA subsidies due to the lower income that accompanies poor health status (Deaton 2002).

In this paper we examine behavioral responses to increased availability of health insurance through the ACA on receipt of Social Security Disability Insurance (SSDI, or DI for short) program participation, using a panel data set of the universe of U.S. tax records spanning 2008-2016. Disability program reliance could increase, as ACA allows individuals to withstand the 24 month wait for health benefits after applying for DI. But DI program participation could also decrease as health insurance is no longer tied to enrollment in that program. We hypothesize these effects will depend on whether individuals had access to health insurance while working.

A large prior literature studies the effects of health insurance availability on labor supply decisions, into which this paper fits. Some of these studies examine health insurance and SSDI applications specifically, including Maestas, Mullen and Strand 2014 who do not find evidence that Massachusetts reform lead to changes in SSDI applications. There is mixed evidence on this question in current working papers, including Schimmel Hyde et al 2017 and Schmidt et al 2017.

The published literature that examine SSI applications impacts from Medicaid expansion (Burns and Dague 2016, Soni et al 2017, Baicker at al 2014) find that Medicaid expansions reduced SSI applications, while Chatterji and Li 2017 finds mixed evidence. Working papers on this topic find mixed evidence (Schimmel Hyde et al 2017 and Schmidt et al 2017). Thus, there is no clear consensus from the literature on the effects of Medicaid expansion on either SSDI or SSI.

Our paper offers several contributions to the literature on social program interactions. First, while almost all prior studies have used Current Population Survey (CPS, ~150 k individuals) or American Community Survey (ACS, ~3 million individuals), our data set contains the population of US tax records, covering the entire tax-paying population of the US. Large sample sizes are necessary to distinguish statistically insignificant but potentially large effects from true zeros. Furthermore, our data contains precise income measures used for determining program benefits eligibility. The Modified Adjusted Gross Income (MAGI) measure is not available in the CPS or ACS, and its omission could lead to attenuation bias when the treatment group is not accurately identified. The large sample size of our data also allows us to examine effects in subpopulations who are affected to greater degrees, such as those with employer health insurance relative to those without. Our methods of identification are otherwise standard: we test these hypotheses comparing disability program participation by individuals in states/counties that experienced a greater extent of coverage availability under the ACA to states that did not, after the ACA to before. We find that insurance expansion appears to increase DI participation for those who did have ESI and decrease DI for those who did not have ESI. However the effects are only present for ACA insurance expansions through marketplace subsidies, not for the Medicaid expansion component. In both cases effects are small. This

indicates that health insurance was not impactful for those at very low levels of income, and even in higher income ranges its fairly modest responses relative to literature.

Background

The US labor force participation rate among the 25-54yr old male population has fallen from 97% in 1967 to 88 percent in 2017 (CBO 2018). While the female labor force participation rate has increase dramatically over the same time period, those increases have halted more recently and it too has experienced slight declines, e.g. falling from 75% in 2007 to 74% in 2017. Over time, the rate of employer health insurance among the non-elderly population has declined substantially, from 64.4% in 1994 to 58.4% in 2011 (EBRI 2012 Fig 1). Over the last several decades, the number of individuals and the cost of the SSDI program to taxpayers have increased, escalating from 2.7 million SSDI recipients in 1970 to 10.4 million in 2017 (SSA 2017), causing the number of disabled workers as a share of all workers to triple from 1970 to 2013 (Schwabish 2016). Especially because of the findings from the literature prior to the ACA that increasing access to alternative sources of health insurance could hurt or help the trend towards higher rates of disability program dependence, it is important to examine the consequences from the ACA.

Disability benefits in the US take two main forms, SSI and DI. Although our data only cover DI, we mention both programs here for context. The DI program serves those with substantial work history, and does not impose income or assets thresholds as eligibility criteria. The amount of the DI benefit is determined by a formula that takes into account the history of earnings and are generally higher than the SSI amounts; unlike for SSI, there are no state supplements to federal DI. Eligibility for a disability program typically also confers eligibility for

health insurance. All SSDI eligible are able to receive Medicare, but only after a 24-month wait from the onset of the disabling condition (and thus from SSDI eligibility). The SSI program primarily targets those who, in addition to meeting the medical criteria for disability, also have low income and low assets. The maximum monthly federal benefit in 2018 was $750 for an eligible individual (SSA 2018). States may provide additional financial stipends, and they can also determine eligibility for Medicaid (Wagner, 2015). In many states SSI automatically confers Medicaid eligibility, and with no waiting period.

The disabled are one and a half more times likely to lack access to private coverage relative to the non-disabled population (Kennedy et al 2017), and unless through a disability program, there was limited access to public health insurance for low income adults in poor health. The ACA allows states the option of increasing Medicaid eligibility for adults aged 19-64 years to 138% of the federal poverty line (FPL). Prior to the ACA, some states provided limited eligibility for parents, but for childless adults, the eligibility threshold was close to 0% FPL. By February 2015, 27 states expanded Medicaid using the ACA's provisions, while the other states opted out of this provision. In all states, those with higher income levels, upto four times the federal poverty level, could access subsidies if they did not have employer health insurance access.

One source of identification for our study is the Medicaid expansion because this cross-state variation can be used to convincingly identify its effects, comparing low income individuals who receive Medicaid in one state to low income individuals in another state who do not receive Medicaid. Traditionally, "notch" studies of the Medicaid expansions have not used income to define the treatment group, because of concern that individuals would distort their incomes downwards to meet and maintain eligibility requirements. However, such a work disincentive

does not exist in the ACA Medicaid expansions, because those who are above the 138% FPL receive generous subsidies that phase out gradually. Nevertheless, we use baseline income rather than contemporaneous income to define treatment and control groups.

A second source of identification is income based variation that allows us to examine impacts of marketplace expansions. In theory all the insurance expansions of the ACA (including the young adult provision, the employer mandate, and the individual mandate) could affect disability application decisions. Although there are some ways to isolate effects even in those other expansion provisions (such as comparing relevant age ranges for the young adult provision), DI applications are not very common at younger ages.

Conceptual Framework

The ability to obtain health insurance separately from DI might decrease reliance on DI because ACA coverage may substitute for the Medicare that made DI especially attractive for the marginal applicant. While private coverage was always available through the individual health insurance market for the disabled population, ACA coverage is more attractive to this population on several dimensions: explicit price subsidies that are income-based, and implicit subsidies because of the community rating (except for limited age adjustments) and guaranteed issue nature of ACA coverage. However, an offsetting effect is possible. DI applications may increase after the ACA because the new coverage may reduce the cost of the 2-year waiting period for Medicare. Kennedy and Blodgett (2012) postulates that the ACA may cause many disability applications decisions to change, forecasting reduced disability applications through the SSI-ACA effect: "Adults with potentially work-limiting disabilities residing in these {expansion} states will be able to obtain Medicaid without first obtaining SSI through disability eligibility."…

"ACA will reduce (Health Insurance Motivated Disability Enrollment) HIMDE, addressing one major source of disability-program growth."

Existing economics research studies the relationship between health insurance, labor supply and program participation in many ways. Health insurance tied to program participation or to work could create a "lock". Thus, ACA coverage can release this lock for those who earlier sought DI at the margin for its health insurance. DI may have been a valuable source of new health insurance especially for those leaving small firms, those working less than full time, or those without working spouses, who may have found difficulty in finding employer health insurance while working.

The alternative route through which program incentives change when new insurance pathways are introduced is through a reduced relevance of the 2 yr wait for DI-related Medicare coverage, a feature used to prevent moral hazard. The ACA now reduces the cost of this 2 yr wait, a factor that should matter most for those covered by employer sponsored insurance (ESI) to begin with; these individuals may now apply at a higher rate for DI. Those who interact with social assistance navigator organizations to inquire about ACA coverage may also be more likely now to hear about DI and apply for it, providing another possible reason to hypothesize increases in DI as a result of the ACA.

More formally, consider an individual with health level θ, which declines over time. θ is connected to the price and availability of health insurance prior to ACA. We use two sources of quasi-experimental variation in health insurance availability: Medicaid and Exchange premium tax credits (PTCs). Suppose this individual works and has no access to health insurance but has an increasing demand for it over time; the outside price of insurance is high in states with low

Medicaid thresholds and with unregulated insurance market. Suppose θ is low enough that the individual could obtain SSDI and thus Medicare but would prefer not to exit the labor force to qualify for SSDI. To this person, ACA coverage will represent a way to remain in the labor force despite declining health status, and not apply for SSDI. Suppose instead that this person has employer health insurance while working, but would prefer to leave employment and rely on SSDI. Prior to the ACA, needing to undergo a 24 month period on SSDI without health insurance prevents them from exiting the labor market. ACA coverage would have an opposite effect on the disability program incentives. This individual who earlier did not apply for SSDI will now do so.

An empirical method to tease apart these two opposing effects on DI behavior as a result of new public insurance is to separately examine the behavior of those who have and do not have prior ESI. This test requires longitudinal data, ESI measures and DI measures, in addition to the usual location information (at least state) and income eligibility information. Large sample sizes and precise income measures are desirable for the ability to pick up what maybe realistically small coefficient sizes.

Prior Literature

Several prominent literatures in economics address the connection between health status, health insurance and labor force behavior. Many of the papers on disability and health insurance study Medicaid effects on SSI behavior, while fewer examine SSDI as an outcome. The mechanisms at play may differ between SSI and SSDI as outcomes since in the case of SSI, states share in the program cost, thus the state is particularly incentivized to encourage beneficiaries to leave SSI and receive the expanded, non-SSI Medicaid.

In descriptive work on health insurance coverage among those on disability programs, Rupp and Riley (2012) link administrative data across DI, SSI, Medicare and Medicaid to examine how health insurance evolves before and after disability program entry. They find, using monthly data, that at first the SSI-only group has higher insurance than the SSDI group, but that as the 24 month period ends, the gap narrows. But Rupp and Riley's data does not include measures of private coverage; Gruber and Kubik (2012) used the Health and Retirement Survey which allows them to consider all sources of coverage, and find that private coverage appears high during the wait period for SSDI such that there are no major dips in coverage rates after SSDI application, although rates of applying for DI are much higher among those who have alternative sources of coverage than just through their own employer. The implication they draw from their results is that eliminating the waiting period for Medicare related to SSDI would substantially increase DI applications, which adds to the impetus for our current study. Rupp and Riley (2012) and Gruber and Kubik (2012) are purely descriptive, but speak to the the importance of health insurance to the population applying for disability insurance programs and thus the possibly large response in application rates to changes in health insurance policy. The next section discusses the policy based causal effects literature which test these predictions.

In one of the first papers investigating the connection between health insurance and disability program participation, Yelowitz (1998) finds that increases in SSI-connected-Medicaid generosity leads more people to enter SSI. This is as expected, as this represents an *increase*, rather than a *decrease* in the relative value of SSI that would occur through expansion in non-SSI Medicaid. In a paper that examines coverage effects of expansions of SSI-tied Medicaid, Wagner (2015) studies state expansions that provided Medicaid to those on SSI with incomes below 100% FPL. She finds a very high rate of crowdout of private insurance on the order of

50% or 100%, also demonstrating the importance of health insurance to the disabled population and consistent with the Gruber and Kubik (2012) results suggestive of high crowd-out of insurance by coverage tied to disability programs. The 2008 average income level for disabled individuals to receive Medicaid was 87% FPL. Wagner takes advantage of Medicaid expansions for disabled populations in 8 states between 1998 and 2003; states had the option since OBRA 1986 to increase the level to 100% FPL, but even as of 2008 the average was 87%, which indicates that the increases through the ACA for subsidies represents a very large increase in generosity beyond SSI-linked Medicaid.

Effect of ACA or ACA-Like Insurance Variation on Disability Outcomes

In contrast to the early set of SSI related Medicaid expansions, the more general public health insurance expansions (Massachusetts reform, ACA and other general insurance expansions) operate through different mechanisms.

In research that examines the effect of non-SSI-Medicaid expansion. Burns and Dague (2017) examine Medicaid expansions from 2001-2013 using ACS data and finds 7% declines in SSI participation of childless adults following the average expansion. Soni et al (2017) finds SSI participation decreased by about 3 percent after 2014 in Medicaid expansion states using SSA administrative totals at the county level. These results are as expected, since beneficiaries now have access to health benefits outside of SSI.

However, the relationship between health insurance and *SSDI* has not been as clear as with SSI. Maestas, Mullen and Strand (2014) study Massachusetts (MA) reform, which is similar to ACA. They examine SSDI and SSI in MA counties relative to counties outside of MA, and find more inflows into SSDI with SSI in counties with low baseline uninsurance (thus a larger

dose of expansion). But they find that applications for SSDI alone increased everywhere, even in counties with low coverage rates; they were not able to test whether this result represents the net impact as a result of offsetting effects for those with and without ESI, which is an area our new work helps advance.

In other studies using ACA expansion variation with mixed results, Schimmel-Hyde et al (2017) studies effect of Medicaid expansion in 2014 on applications to DI and SSI using SSA administrative data on applications for benefits. Their DD study design is to find within-state geographical units that look similar in expansion and non-expansion states, to solve problems with non-parallel trends at the state level. After propensity matching PUMAs in control and treatment states based on disability application trends and baseline values of other characteristics, they perform a unit by unit analysis. That is, they comment on the effect of Medicaid on SSI and DI in each state, finding that in some states there are declines and in other states there are increases. There is also a mixed picture, depending on the state, on whether its SSI or DI applications that are affected. They conclude that learning from state officials reasons why each state may have displayed a different effect is a fruitful direction for further work, although they also caution that the choice of different control groups for each state may affect these results.

Another ACA-disability program paper, using ACS, uses a different identification methods: Shore Sheppard, Schmidt and Watson (2017) examine the impact of Medicaid expansion using a county border pairs such that borders are between states with and without expansion, 2014 ACA Medicaid expansion. Chatterji and Liu (forthcoming) examine effect of Medicaid expansion in four early-ACA-expansion states, on disability outcomes. They use SSA aggregates and CPS data on SSI and DI outcomes (applications, awards, new entry, stock). They

use a DD method, with synthetic controls. The early expanders are the treatment control and the late expanders (who expanded January 2014) are the control states. They find a reduction in SSI beneficiaries in CT, but all other outcomes and all other states do not exhibit any convincing pattern of results indicating whether Medicaid expansion systematically affected outcomes.

Other literatures related to our work include effect of ACA on labor markets: Kaestner at al, Gooptu et al, Levy, Nikpay and Buchmueller all find not much evidence that work behavior changes in the general population as a result of health insurance. Dillender et al, (2017) finds some effects on part time work from the employer mandate, not from insurance expansion. The literature on effect of ACA on health insurance is also relevant, as the "first stage" of the story that coverage changes were substantial: many papers show clear effects (eg Soni et al 2017), however the size of the DD (difference in coverage rates between expansion and non-expansion states) is not extremely large because the ACA increased coverage rates in all parts of the US quite substantially, compromising the power of DD style identification strategies.

In summary, there has been much economic interest in disability programs and health insurance, looking both at SSI related health insurance as well as public subsidies to health insurance. Although results so far have been mixed with respect to which of the multiple incentives are stronger on next, the literature forecasts that ACA expansions will be substantial for disability program decision making.

Data

We test hypotheses from our conceptual model using data from the universe of U.S. tax returns that spans 2007-2016. These data are advantageous relative to other possible sources, such as the Current Population Survey or SSA administrative data, for a number of reasons. First,

the exact measure of income relevant for provisions of the Affordable Care Act (namely, Modified Adjusted Gross Income, or MAGI) comes directly from individuals' tax returns, and so it is measured without error in the tax data. Second, as we discuss below, though information on which workers have ESI is limited, the tax data include a reliable proxy for ESI access, namely whether the individuals' employer offers an employer-sponsored pension plan. Moreover, the tax data contain administrative third party reports of disability benefit receipt, which are subject to less misreporting than are self-reported measures. Finally, the potential sample sizes are substantially larger than can be found in survey data, and so it is possible to focus in on small subsets of the population without sacrificing precision.

In tax data, DI benefit receipt is reported on Form SSA-1099. On this form, the Social Security Administration reports the amounts and types of benefits (e.g., old age or disability insurance) that were received from the Social Security Administration in a given tax year. Thus, if some amount of DI benefits is reported on this form, we know that the individual was a DI recipient in that year.[1] In addition, this form contains the recipient's address, from which we can observe their state of residence.

We combine the information from the SSA-1099 forms to other information collected on tax forms, including income and presence of children (from Form 1040), wages and the presence of an employer sponsored retirement plan (from Form W-2), and age (from the DM1 file). To focus on those who were not eligible for Medicare, and who could not gain private health insurance through a parent's plan, we cut the sample to those aged 27-64 in each year. In order to exactly observe FPL, we limit the sample to the 98% of individuals who filed a 1040. Using the

[1] Note there is a five-month waiting period between the individual's onset date and when he or she begins receiving cash benefits. In practice, this waiting period has already lapsed before many new beneficiaries apply for benefits.

resulting dataset, we then identify new DI recipients as those who had no SSA-1099 with DI benefits in year t-1, but did have DI benefits in year t.

To examine the impact of the ACA on DI claiming, we first identify which portions of the ACA (Medicaid expansions, Premium Tax Credit subsidies, or neither) applied to each individual in our dataset.

Medicaid expansion eligibility depends on the individual's state of residence. Thus, using information on state of residence from SSSA-1099, we infer whether some resided in a state that did not expand Medicaid (expansion = 0), that expanded Medicaid in 2014 (expansion =1), or that expanded Medicaid prior to 2014 (expansion =2).

Medicaid eligibility also depends on income (in particular, MAGI) relative to the Federal Poverty Line (FPL), as does eligibility for a Premium Tax Credit. We calculate MAGI directly from the 1040 form, and compare this to the FPL that would apply given their marital status and number of children reported on the form.

Finally, since the DI claiming response to the ACA may differ depending on whether an individual has employer-sponsored insurance (ESI), we identify which individuals have ESI in the year prior to claiming DI. Unfortunately, information on the receipt of ESI is not available in tax data until 2012, and even then is only required for employees of large firms (those with more than 250 employees). Thus, as a proxy for having ESI, we use information on whether the individual had an employer-sponsored retirement plan reported on a W-2 form, since the two are highly correlated, and information on employer-sponsored retirement plan coverage is available in all of the years of our sample. In the CPS and the Medical Expenditure Panel Survey (MEPS), of families where at least one parent reported receiving an employer-sponsored retirement plan, more than 90% were also covered by ESI. For this reason we treat reporting a retirement plan as

a proxy for availability of health insurance. Since we find that approximately 20% of families in the MEPS who do not have employer-sponsored retirement plans are also covered by ESI, not contributing to a retirement plan is a weaker proxy for lack of health insurance.

Empirical Strategy

Our two empirical approaches are tied to our working hypotheses on how the ACA might affect the decision to apply for Disability Insurance, and how those effects might differ depending on prior income and ESI coverage. First, we examine the impact of the Medicaid expansions on the share of DI beneficiaries eligible for the expansion. Second, we examine the differential impact of low vs. high cost subsidies on the share of DI beneficiaries eligible for the subsidies separately for those with and without prior ESI access.

Impact of Medicaid Expansions

Prior to the ACA, among low income individuals, some people may have applied for DI in order to get health insurance. However, the ACA's Medicaid expansions provide alternative ways for low income individuals to get health insurance. Thus, we'd expect to see *declines* in the fraction of newly DI that are low income in Medicaid expansion states relative to non-expansion states.

To examine whether this is the case, we use a difference-in-differences strategy, estimating whether the fraction among newly disabled with low income (<100% FPL) declined in expansion states. We cut the sample to include only those who are newly disabled, and estimate models of the form:

(1) $y_{i,s,t} = \alpha + \beta\, Expansion_s + \gamma Post_t + \theta\, Expansion_s * Post_t + \tau_{t,m} + \eta_s + \Gamma X_i + e_i$.

The dependent variable denotes whether the newly disabled individual's income in the baseline year (the year before claiming DI) was below 100% FPL. Expansion denotes whether they resided in a Medicaid Expansion state, and Post indicates whether the observation comes from a year after the expansion (2014). The coefficient on the interaction between Expansion and Post, θ, is an estimate on the differential share of low-income individuals among the new DI recipients in Medicaid expansion states relative to other states. A negative estimate would be consistent with the hypothesis noted above.

We include year fixed effects, state fixed effects, and a control for the change in the labor market conditions (state unemployment rate) from the baseline year to the next year. We control for demographic characteristics in X, and in alternative models, we test heterogeneity of the impact by these characteristics (such as how effects differ for females vs. males, married vs. single, etc.).

Figure 1 depicts our research design by examining graphically whether there appears to be a decline in the fraction of newly DI that are low income in Medicaid expansion states. For this, we divided the sample of newly disabled into those from non-expansion states, states that expanded Medicaid in 2014, and state that expanded Medicaid prior to 2014, and graph the trend in the share of new DI claimants who had income below 100% FPL. Although the share of low income new DI claimants declines in Medicaid expansion states after 2014, it appears to decline just as much in non-expansion states. This graph, then, suggests that the ACA Medicaid expansion did not lead to a decline in low income DI claimants.

Table 2 presents the results from pre-trends tests of the Medicaid expansion specification in (1), which show no differential pre-trends among ACA expansion states compared to non-expansion states during the pre-period, bolstering our difference-in-differences methodology.[2]

Impact of Premium Tax Credits

Prior to the ACA, some moderate income individuals who did not have employer-sponsored insurance may have applied for DI in order to get health insurance. However, the ACA's Health Insurance Marketplace and Premium Tax Credit subsidies provides an alternative ways for these individuals (with income between 138-400% FPL) to get affordable health insurance. Thus, we'd expect to see *declines* in the fraction of newly DI among those with income between 138-400% FPL who didn't have ESI in the prior year.

However, prior to the ACA, some moderate income individuals who did have ESI may have refrained from applying for DI because they would need to go through waiting period without a job and so without their ESI. Since the ACA provides an alternative way to get health insurance, so we'd expect to see increases in the fraction of newly DI that have income between 138-400% who did have ESI in the prior year.

In Figure 2, we examine whether there appears to be a decline in the fraction of newly DI that are moderate income (138-400%) who didn't have ESI in year prior, and whether there appears to be an increase in the fraction of newly DI that are moderate income who had ESI in year prior. For these graphs, we divided the sample into those who were likely to have ESI (based on coverage under and employer sponsored retirement plan), and those who were likely to be without ESI, and graph the trend in the share of new DI claimants who had moderate incomes,

[2] There is a marginally significant coefficient on the time trend for early expansion states, but this is not our subgroup of interest.

between 138% and 400% of FPL. The fraction of new DI claimants who are moderate income who had ESI stays flat or increases, while the share with moderate income who didn't have ESI declines. The results, then, are consistent with the ACA Marketplaces leading to an increase in DI claiming among those who had ESI, and a decrease among those without ESI.

To test our hypotheses directly, we again use a difference-in-differences strategy, but we now compare those from counties with a low versus high health insurance costs, since people in low cost counties should be more affected by the availability of Marketplace insurance and subsidies than those from high cost counties. We again cut the sample to include new DI claimants, and estimate models of the form:

(2) $y_{i,s,t} = \alpha + \beta\, LowCost_i + \gamma Post_t + \theta\, LowCost_i * Post_t + \tau_{t,m} + \eta_s + \Gamma X_i + e_i$.

In this specification, the dependent variable denotes whether the newly disabled individual's income in the baseline year (the year before claiming DI) was between 138-400% FPL. LowCost denotes whether the resided in a county with lower than median costs, and all other variables are defined as above.

The coefficient on the interaction between LowCost and Post, θ, is an estimate on the differential share of moderate income individuals among the new DI recipients in counties with low costs relative counties with high costs. Note, however, that the hypothesized sign of θ differs depending on whether the individual had ESI in the prior year. Thus, we estimate two forms of this equation. In the first, the dependent variable denotes that the individual's income was between 138-400% FPL and that they previously had ESI, while in the second, the dependent variable denotes that the individual's income was between 138-400% FPL and that they did not previously have ESI. In the first specification, a positive coefficient would be

consistent with the effect hypothesized above (implying that the ACA led to an increase in DI claims among moderate income people who had ESI), while in the second, a negative coefficient would be hypothesized (implying the ACA led to a decrease in DI claims among those who didn't have ESI, and may have claimed DI to get health insurance).

To determine whether an individual resided in a low or high cost county, we use two approaches. In the first, use the cost of the second-lowest cost silver plan for a reference person. In the second, we use the Dartmouth Atlas of Health Care measure of Medicare spending.[3] In each of these measures, low or high cost status is driven only by geography, and not by the age or health condition of the individual. Table 3 presents the pre-trends tests when the cost of the second-lowest cost silver plan (SLCSP) is used to divide counties into high and low cost, while Table 4 presents the pre-trends when Medicare costs are used to divide counties. Across both tables, no statistically significant coefficients were found, suggesting that pre-existing trends in low- and high-cost counties were not significantly different, regardless of how we separate the counties.

Results

Impact of Medicaid Expansions

Table 5 presents the estimation results for the Medicaid expansion specification. Columns 1 and 2 present results without covariates and with covariates, respectively. The dependent variable denotes being a new DI claimant and having income below 100% FPL, and the coefficients of interest are the interactions between residing in an ACA Medicaid expansion state in a post-reform year. If the ACA Medicaid expansion led to a decline in DI claims, we would expect these coefficients to be negative, as it would denote that the share of those with

[3] See http://www.dartmouthatlas.org/tools/downloads.aspx.

income below 100% FPL fell among expansion states relative to non-expansion states. Across these specifications, though several coefficients for the ACA expansion states in the post-period are negative, the magnitudes are quite small, and none are statistically significant. These results, then, are consistent with the graphical trends above, suggesting that the ACA Medicaid expansion did not lead to a decrease in DI claims among low income individuals.

Impact of Premium Tax Credits

We next examine whether the availability of health insurance through an ACA Marketplace led to a decline in DI claiming among those without ESI, and an increase among those with ESI, by estimating (2).

The estimation results when the SLCSP is used to split counties into high and low costs are presented in Table 6. The dependent variable denotes being a new DI claimant and having income between 138% and 400% FPL, and the coefficients of interest are the interactions between residing in a low-cost county in a post-reform year. Columns 1 and 2 present results among the sample who had (our proxy for) ESI, while Columns 3 and 4 present results among those who did not. If the availability of an ACA Marketplace plan led to an increase in claims among those with ESI and a decrease among those without ESI, and if living in a lower-cost area magnified that effect, we would expect to see positive coefficients in the first two columns and negative coefficients in the second two. However, the coefficients do not follow this pattern, and none are statistically significant. These results, then, would suggest that the availability of Marketplace insurance did not affect DI claiming among those with moderate income.

However, the results in Table 7, when Medicare Spending is used to divide counties into high and low cost, tell a different story. Here, positive effects are found in the sample of those

with ESI, and negative effects are found in the sample of those without ESI, consistent with the expectation that low-cost Marketplace Insurance would lead to an increase in DI claims among moderate income individuals who had ESI (since they would be more willing to leave their job and lose ESI if they had an alternative source of health insurance), and a decrease among moderate income individuals without ESI (since they wouldn't have to claim DI in order to have a source of health insurance).

To probe these results further, in Table 8, we examine whether the effects differ by the level of moderate income under consideration. Because the ACA's Marketplace Premium Tax Credits are larger for those with lower incomes, we might expect that the effects are larger for those with lower incomes. In this table, then, we divide the dependent variable into income subgroups. In Panel A, the dependent denotes being a new DI claimant and having between 138% and 200% FPL, between 200% and 250% FPL in Panel B, between 250% and 300% FPL in Panel C, and between 300% and 400% FPL in Panel D. Consistent with this expectation, we find larger effects in Panel A among the lowest income group that we find among higher income groups in Panels B and C. However, we do find significant effects in Panel D among the highest income group. Taken together, these results appear to suggest that the impact of the ACA Marketplace Insurance on DI claiming among those with moderate income is particularly acute among low-income individuals who have access to the largest subsidies, and higher-income individuals who may have more income available to purchase Marketplace insurance.

Discussion and Conclusion

We examine the causal relationship between publicly funded health insurance and disability benefits. This has important implications for tax policy because increased reliance on

disability insurance benefits decreases taxable earnings and employment tax receipts, and also because increased ACA sign-ups induced by this route would increase tax expenditures on premium tax credits and Medicaid federal share of funding. We hypothesize that ACA insurance expansions may decrease reliance on Social Security disability programs for some potential beneficiaries by providing an alternative avenue for health insurance. On the other hand, disability program participation may also increase as ACA coverage makes DI's two-year waiting period for Medicare less costly.

Changes in benefit receipt caused by the ACA may be positive or negative, and could affect program spending on both cash and healthcare benefits. The disabled, who often have high health care needs, place a high valuation on the public health insurance programs that accompany cash benefits (Livermore et al 2001). However, because these benefits are means tested, there is concern that participants' labor market behavior may be distorted. Despite programs like DI's "Ticket to Work," (and similar provisions for SSI under 1619(b) of the Social Security Act) there is still concern that people may be locked into disability programs because of health insurance (Coe and Rupp, 2013), and it may be especially hard to find new jobs with generous benefits when leaving the program. Similar concerns exist on the entry side, in that the provision of health insurance may lead to higher rates of entry than otherwise. Both of these factors would lead to public spending on DI being higher than the counterfactual case with no change in health insurance policy. Just as delinking jobs and health insurance may lead to increased efficiency in the job market, separating health insurance from DI may increase program efficiency. The ACA provides an opportunity to examine this behavior because of the unprecedented increase in public insurance this represents for non-elderly adults.

Using the data on universe of U.S. taxes filed 2007-2016, we find the Medicaid expansion did not cause a measurable change in the fraction of new DI beneficiaries benefiting from the expansion. However, when we examine the effects of the ACA Marketplace subsidies, we find suggestive evidence that larger subsidies increased DI participation among individuals with prior ESI and decreased DI participation among individuals without prior ESI. These results imply that DI application behavior appear relatively unaffected by Medicaid expansions, perhaps because those who are DI only applicants are largely not likely to be under 100% FPL, the income range in which Medicaid expansion changes access to health insurance the most. Understanding the reasons for the lack of responsiveness on this margin is a fruitful direction for new research. Our results also imply that while marketplace subsidies are important, and in the directions predicted by theory (an increase in SSDI applications for those now released by "job lock" and a decrease in SSDI applications for those who fall into the category of "Health Insurance Motivated Disability Enrollment (HIMDE) " in Kennedy and Blodgett (2012); however, the effect sizes are small relative to the prior literature, suggesting that the ACA overall did not affect DI applications rates by quite the magnitudes that the literature earlier anticipated.

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Tables

[4]Table 2. Pre-Trends Tests, Medicaid Expansion Specifications

	(1)	(2)
ACA Expansion x Time	-0.000	-0.000
	(0.001)	(0.001)
Early Expansion x Time	-0.001	-0.002*
	(0.001)	(0.001)
Covariates	No	Yes
Observations	3,465,125	3,465,125
R-squared	0.005	0.050

Notes: Data from 2007-2016 extract of 1040 filers, U.S. Tax Returns. Robust standard errors are in parentheses. * indicates p=.10; ** p=0.05, *** p=0.01

Table 3. Pre-Trends Tests, Probability of Newly Disabled Being Moderate Income, Low Second Lowest Cost Silver Plan Specifications

Moderate Income with: (138% FPL < Income < 400% FPL)	ESI (1)	ESI (2)	No ESI (3)	No ESI (4)
Low SLCSP x Time	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Covariates	No	Yes	No	Yes
Observations	3,540,327	3,540,327	3,540,327	3,540,327
R-squared	0.002	0.003	0.002	0.003

Notes: Data from 2007-2016 extract of U.S. Tax Returns. Robust standard errors are in parentheses. * indicates p=.10; ** p=0.05, *** p=0.01

[4] Please note that there is no Table 1 in our paper, thus tables start numbering from Table 2.

Table 4. Pre-Trends Tests, Probability of Newly Disabled Being Moderate Income, Medicare Spending Specifications

Moderate Income with:	ESI	ESI	No ESI	No ESI
(138% FPL < Income < 400% FPL)	(1)	(2)	(3)	(4)
Low Cost x Time	0.001	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Covariates	No	Yes	No	Yes
Observations	3,540,129	3,540,129	3,540,129	3,540,129
R-squared	0.002	0.003	0.002	0.003

Notes: Data from 2007-2016 extract of U.S. Tax Returns. Robust standard errors are in parentheses. * indicates p=.10; ** p=0.05, *** p=0.01

Table 5. Estimation Results, Medicaid Expansion Specifications	(1)	(2)
ACA Expansion x 2014	-0.001	-0.000
	(0.004)	(0.004)
ACA Expansion x 2015	-0.002	-0.000
	(0.004)	(0.004)
ACA Expansion x 2016	-0.004	-0.002
	(0.004)	(0.004)
Early Expansion x 2014	-0.002	-0.003
	(0.005)	(0.006)
Early Expansion x 2014	-0.002	-0.002
	(0.006)	(0.007)
Early Expansion x 2014	-0.002	-0.001
	(0.005)	(0.006)
Covariates	No	Yes
Observations	4,758,341	4,758,341
R-squared	0.005	0.051

Notes: Data from 2007-2016 extract of 1040 filers, U.S. Tax Returns. Robust standard errors are in parentheses. * indicates p=.10; ** p=0.05, *** p=0.01

Table 6. Estimation Results, Probability of Newly Disabled Being Moderate Income, Low Second Lowest Cost Silver Plan Specifications

Moderate Income with:	ESI	ESI	No ESI	No ESI
(138% FPL < Income < 400% FPL)	(1)	(2)	(3)	(4)
Low SLCSP x 2014	-0.002	-0.002	0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Low SLCSP x 2015	-0.001	-0.001	0.000	0.001
	(0.003)	(0.003)	(0.004)	(0.003)
Low SLCSP x 2016	-0.003	-0.003	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Covariates	No	Yes	No	Yes
Observations	4,866,371	4,866,371	4,866,371	4,866,371
R-squared	0.002	0.003	0.002	0.003

Notes: Data from 2007-2016 extract of U.S. Tax Returns. Robust standard errors are in parentheses. * indicates p=.10; ** p=0.05, *** p=0.01

Table 7. Estimation Results, Probability of Newly Disabled Being Moderate Income, Medicare Spending Specifications

Moderate Income with: (138% FPL < Income < 400% FPL)	ESI (1)	ESI (2)	No ESI (3)	No ESI (4)
Low Cost x 2014	0.006**	0.006**	-0.005	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Low Cost x 2015	0.008***	0.008***	-0.005**	-0.005*
	(0.002)	(0.002)	(0.003)	(0.003)
Low Cost x 2016	0.011***	0.010***	-0.007***	-0.007***
	(0.003)	(0.003)	(0.003)	(0.003)
Covariates	No	Yes	No	Yes
Observations	4,865,903	4,865,903	4,865,903	4,865,903
R-squared	0.003	0.003	0.002	0.003

Notes: Data from 2007-2016 extract of U.S. Tax Returns. Robust standard errors are in parentheses. * indicates p=.10; ** p=0.05, *** p=0.01

Table 8. Estimation Results, Probability of Newly Disabled Being Moderate Income, Medicare Spending Specifications - by Income Subsets

A. Moderate Income with: (138% FPL < Income < 200% FPL)	ESI (1)	ESI (2)	No ESI (3)	No ESI (4)
Low Cost x 2014	0.002	0.002	-0.002*	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Low Cost x 2015	0.003***	0.003***	-0.003***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Low Cost x 2016	0.003**	0.003***	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Covariates	No	Yes	No	Yes
Observations	4,865,903	4,865,903	4,865,903	4,865,903
R-squared	0.001	0.001	0.001	0.004
B. Moderate Income with: (200% FPL < Income < 250% FPL)	ESI (1)	ESI (2)	No ESI (3)	No ESI (4)
Low Cost x 2014	0.001	0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Low Cost x 2015	0.001	0.001	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Low Cost x 2016	0.002***	0.002***	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Covariates	No	Yes	No	Yes
Observations	4,865,903	4,865,903	4,865,903	4,865,903
R-squared	0.001	0.001	0.000	0.001

Notes: Data from 2007-2016 extract of U.S. Tax Returns. Robust standard errors are in parentheses. * indicates p=.10; ** p=0.05, *** p=0.01

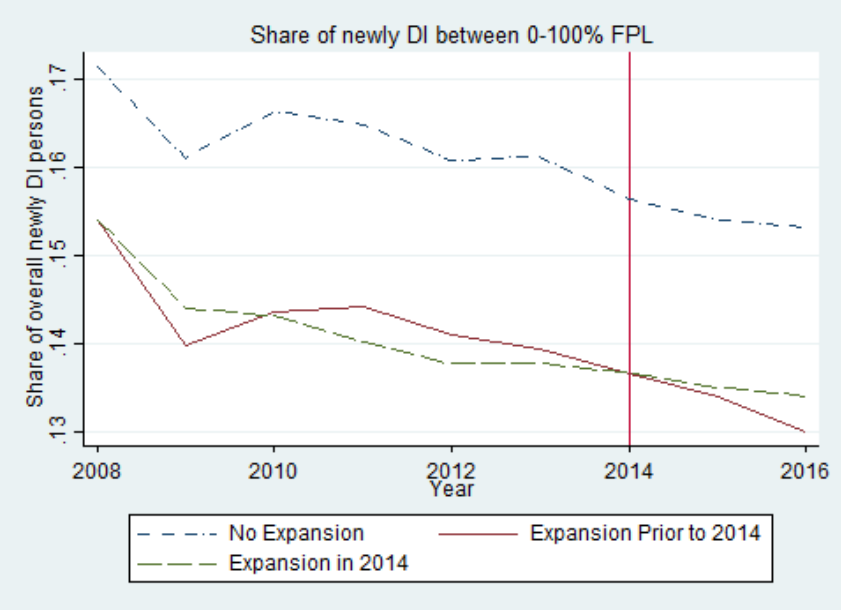
Table 8, Continued. Estimation Results, Probability of Newly Disabled Being Moderate Income, Medicare Spending Specifications - by Income Subsets

C. Moderate Income with: (250% FPL < Income < 300% FPL)	ESI (1)	ESI (2)	No ESI (3)	No ESI (4)
Low Cost x 2014	0.001	0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Low Cost x 2015	0.001	0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Low Cost x 2016	0.001	0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Covariates	No	Yes	No	Yes
Observations	4,865,903	4,865,903	4,865,903	4,865,903
R-squared	0.001	0.001	0.000	0.001
D. Moderate Income with: (300% FPL < Income < 400% FPL)	ESI (1)	ESI (2)	No ESI (3)	No ESI (4)
Low Cost x 2014	0.002**	0.002*	0.000	0.000
	(0.001)	(0.001)	(0.002)	(0.002)
Low Cost x 2015	0.003***	0.003***	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Low Cost x 2016	0.004***	0.004***	-0.003*	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)
Covariates	No	Yes	No	Yes
Observations	4,865,903	4,865,903	4,865,903	4,865,903
R-squared	0.001	0.003	0.001	0.002

Notes: Data from 2007-2016 extract of U.S. Tax Returns. Robust standard errors are in parentheses. * indicates p=.10; ** p=0.05, *** p=0.01

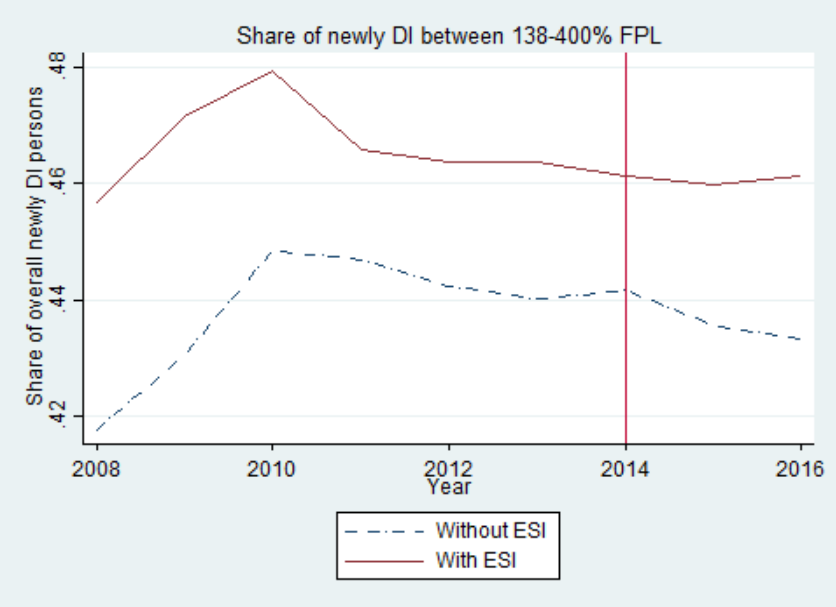
Figures

Figure 1. Share of New DI Recipients that are Low Income, by Medicaid Expansion Status



Notes: Authors tabulations from U.S. population of income tax returns, 1040 filers, 2007-2016.

Figure 2. Share of New DI Recipients that are Moderate Income



Notes: Authors tabulations from U.S. population of income tax returns, 1040 filers, 2007-2016.