Disability Insurance and the Medicare Waiting Period

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Spring, 2014

Working Paper

I. Intro

Medicare is the universal public health insurance program for all individuals in the United States age 65 and older. The only exception to the age-65 eligibility requirement is that recipients of Social Security Disability Insurance (DI), a program that gives cash income support to individuals with established work history who are no longer working due to health reasons, can enroll at any age. However, Medicare eligibility is not coincidental with DI recipiency. Individuals must wait two years after beginning DI before they can apply for Medicare. The health insurance of individuals on DI during the waiting period and after Medicare eligibility is the subject of this analysis.

The transition of the DI population from wages to cash transfer is well studied. DI rolls have been rising over time, as documented in Autor (2011), and so has the analysis studying that fact, from modeling the decision to claim benefits, the timing of when individuals apply, the work incentive structures in place in the program, and how effective these are in returning individuals to work, as noted in Autor and Duggan (2003), Bound (1989) and Bound and Waidmann (1992), among many others. However, the concurrent transition of the DI population from private health insurance to public coverage has not been explored. There is a wellspring of research looking at other populations who become eligible for public coverage, most notably by Cutler and Gruber (2009), who find evidence of considerable crowd out of private coverage from Medicaid expansion, a result confirmed in Gruber and Simon (2008), and Engelhardt and Gruber (2010), which finds evidence of crowd out from the Medicare Part D expansion. This paper aims to bridge these two strands of the literature—the transition from employment and the crowd out typically associated with public health coverage. I will start by examining health insurance before and after Medicare eligibility, or equivalently, during the waiting period and after.

There are two primary reasons for a two-year waiting period between DI benefits and Medicare eligibility, both of which offer a motivation for the analysis presented here. The first, as explained in a Social Security Administration research paper (Bye and Riley, 1989), is cost saving. A two-year delay in eligibility avoids expensive end-of-life care for the terminally ill. In their paper, Bye and Riley use the 1972 New Beneficiary Survey, which follows the 1972 cohort of DI beneficiaries for ten years, to calculate what the Medicare cost to the federal government would have been, had all beneficiaries been covered by Medicare immediately. They conclude that eliminating the two-year waiting period would have made the total 10-year Medicare bill of the cohort 45% higher, primarily due to end-of-life care. However, there is reason to question the consequences of this cost saving. If individuals who are disabled and not working are constrained in their choices in securing health care or coverage, the waiting period could effect health outcomes, as individuals could be prompted to delay care, and individual finances, if they incur higher out-of-pocket costs. Morever, while Medicare as a program saves money, the wait in eligibility for DI recipients could shift costs to other programs, such as Medicaid, or other entities, such as community health centers, who vary in efficiency and effectiveness in delivering care.

The second reason for a waiting period, outside of Medicare cost saving, is to incentivize the return

to work. DI is intended as a wage replacement for individuals who can no longer work, but the steady benefit can also create a disincentive for individuals to return to the labor market, even if they become well enough to do so. A wait for Medicare can be seen as a way to prevent adding to this disincentive. The concern is that if individuals who start DI benefits simultaneously receive public health coverage, they have even less motivation to return to employment, which is the primary means of securing private health coverage. The waiting period does not eliminate this effect, but does delay it.

The first step in evaluating the waiting period—both the consequences of cost saving and the incentive to return to work—is the document the insurance choices of individuals in the current environment. I will examine health insurance coverage before and after Medicare eligibility, or equivalently, during the waiting period and after. This produces the necessary context for the level of health care of the individual, how much the individual and other government entities pay, and what insurance incentives exist that motivate or hinder the return to work.

This study is greatly aided by the prior work on the effect of Medicare eligibility on the age-65 population, especially similar before-and-after studies in in Card et al. (2008) and Card et al. (2009). One contribution of the analysis presented in this paper is a view of Medicare divorced from age and the events often coincidental with universal eligibility at age 65, such as retirement or eligibility for full Social Security Old Age Insurance benefits. The DI population can be eligible at any age, and the mandatory waiting period creates a window akin to a natural experiment to view the introduction of Medicare. The large caveat is that the study is not of a representative population, but a chronically sick one.

Using panel data from the 2008 Survey of Income and Program Participation (SIPP), I perform an event study with individual fixed effects to regress each of the first six years of DI tenure on eight different dependent variables: three public insurance programs (Medicare, Medicaid, and military coverage); four types of private insurance, employer- or union-sponsored coverage (ESI), which is also broken into two exclusive sub-categories, ESI owned by the individual and ESI owned by another person, and privately purchased coverage; and lack of insurance, or uninsurance.

The paper proceeds as follows: Section II provides a policy background to Disability Insurance and forms of health coverage, Section III details the data used and construction of variables of interest. Section IV presents the model, results, and robustness, and Section V concludes the paper and outlines a further research agenda.

II. Policy Background

Disability Insurance

Social Security Disability Insurance (DI) became law in 1956 as an amendment to the 1935 Social Security Act. DI is a part of a social insurance system; workers pay premiums as a payroll tax to earn insurance coverage for themselves and their dependent family members that offers protection against

the risk that they will not be able to work—in the case of DI, if they become too sick. Importantly, this means that DI eligibility is based on work history and health, but not income.

To attain DI benefits, individuals apply to the program through a local Disability Determination Office with a complete summary of work history, medical history, lab tests, prescription history, tax forms, and evaluations from the individual's doctor. DI applicants must pass a two-part earnings test, showing that they have a work history, but have not earned substantial income in the past six months, in addition to being determined to be medically disabled. The initial application time varies from 0 - 12 months and if an individual is rejected, they can appeal the decision to a Social Security judge, which can take an additional 1 - 12 months.

To clarify, DI is not means tested in the sense that it is not a program targeted or limited to a low-income population, the way that Supplemental Nutrition Assistance or Temporary Assistance to Needy Families is. All individuals who worked in Social Security covered employment, even if they were in the top 1% of wage earners, can apply to DI. However, because it is a program targeted to individuals who cannot work due to an illness, individuals applying cannot be working. The income test of DI is not that the individual's *former* income must be below some threshold, but rather that *current* wage income must be zero, or near zero.

DI benefits, once awarded, continue until the individual reaches retirement age, at which point they switch to retirement benefits, unless the individual returns to work. Individuals on DI can work 9 months within a 60-month period at any earnings level and receive full DI benefits (trial period). After 9 months, benefits are stopped if the individual makes over a certain amount ($1010 per month in 2012), or continue for another 36 months if they make under that amount (extended period). Again, the income test is a proxy for an ability-to-work test. Individuals who leave DI can resume DI benefits without reapplying within five years of stopping.

Since 1972, DI recipients have been eligible for Medicare after a two-year waiting period. Regardless of the length of time spent processing the original DI application, beneficiaries are eligible for Medicare 24 months after the first DI check is received.[1] The work restrictions and benefit rules discussed for DI do not apply to Medicare; if Medicare is awarded, coverage continues for 93 months after leaving DI, regardless of earnings.

There are two items worth particular note for later analysis in this paper. One, the lower bound of the length of time from leaving work to becoming Medicare eligible is 30 months, assuming the individual applied for DI exactly six months after stopping work and was approved immediately. The upper bound can extend additional months or years if she had been out of work longer than six months before applying to DI, if her application took time to process, or if she was originally rejected. Two, because of the work incentives and allowances, as well as the ability to maintain Medicare, it is possible that a DI beneficiary

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[1]There are two exceptions to this rule. DI recipients with end stage renal (kidney) failure are eligible for Medicare three months after their dialysis begins. DI recipients with Amyotrophic Lateral Sclerosis (ALS, or Lou Gehrig's disease) are eligible for Medicare immediately. In addition, DI beneficiaries who successfully appealed an initial rejection can also appeal their eligibility 24 months since their rejection, rather than initial benefit receipt.

is working while on DI or that a DI beneficiary can begin (resume) DI with Medicare coverage.

Possible sources of health coverage

Medicare is awarded to all individuals at age 65 and continues to their death, or to DI recipients after a two-year waiting period. It is universal in the context of eligibility, as there is only an age requirement, but it is not limitless in coverage. Certain services, such as long-term care, are not included in Medicare, nor does Medicare allow for dependent coverage. The program is also not free; beneficiaries must still pay premiums, coinsurance, copayments, deductibles, and other out-of-pocket expenses.

Medicaid is the state-run health insurance program for low-income families that some DI recipients will qualify for separately from DI. As previously noted, DI benefits are part of Social Security; individuals from any prior earnings level can apply and benefits are based on earnings history, not need. On the other hand, Supplemental Security Income (SSI) is a separate welfare program that provides additional cash benefits to elderly, blind, and disabled individuals who are also in poor households. It can be confusing, because individuals on DI are restricted from earning a wage income, but they can still garner income from other sources, as well as be in a household with working individuals. DI beneficiaries who begin DI in low-income households are awarded SSI initially. Or, DI beneficiares whose income falls over time can become eligible for SSI after DI has already begun. Regardless of when it was awarded, SSI recipients are eligible for Medicaid, which has no waiting period. Medicaid and Medicare can be jointly consumed; they are both public programs, but do not offer the same type of coverage. Notably, Medicaid coverage is considered more comprehensive and covers many of the out-of-pocket expenses Medicare does not.

Military coverage is a separate public health coverage system for veterans, actively serving members of the military, and in some programs, their spouses and children. Military coverage includes TRICARE, CHAMPUS, CHAMPVA, and VA health care. Individuals with military coverage use that coverage as their primary care, but are required to sign up for Medicare if they become eligible.

Employer-sponsored insurance is private insurance sponsored and partially paid for by the employer. Workers can[2] be offered benefit plans for themselves and possibly their family as part of the compensation package. Plans very widely in quality, cost, and services covered. An individual can have ESI through her own employment (self-owned plan) or a family member's (owned by another individual). It is possible to maintain ESI, self-owned coverage even if an individual is no longer working if the continued coverage was negotiated as part of a retirement package, a severance package, or if the individual qualifies and can afford COBRA benefits.[3]

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[2]ESI has been declining steadily for two decades, as fewer employers offer plans. In 2000, 69.2% of the under 65 population had ESI, compared with 58.6% in 2011 (Gould, 2012). Workers with lower wages are much less likely than their high wage counterparts to have ESI. In 2010, only 41.0% of of workers in the bottom wage quintile, making at or below $9.38 and hour, had ESI, compared to 85.1% in the highest wage quintile, making at or above $30.00 an hour (Gould, 2012).

[3]The Consolidated Omnibus Reconciliation Act (COBRA) of 1986 outlined rules for employees leaving employment for reasons other than gross misconduct to maintain their health coverage for 18 months, so long as they pay both the employer and employee side. The bill also includes an exception for individuals with a disability, allowing for them to continue for an additional 11 months.

Purchased coverage is private plans that are purchased by the individual directly from the insurer.

III. Data

Sample

The 2008 Survey of Income and Program Participation (SIPP) is a four-year panel study of 171,987 individuals in 52,031 households. I made four reductions to this sample. I dropped all individuals who did not receive some kind of Social Security benefit,[4] those who were age 65 when the panel began and already eligible for Medicare, and anyone who did not indicate they received coverage through their own work history, removing any dependents. Last, I reduced the panel to DI beneficiaries only, removing any Old-age or Survivor beneficiaries. The SIPP does not ask what type of Social Security insurance benefit an individual receives, but does ask for the reason they receive benefits. Individuals were kept in the sample if they answered that disability was the primary and only reason for receiving Social Security.

After this last cut, the reduced sample is 6,320 individuals, or 3.7% of the original sample, all under the age of 65 when the survey began, all reporting Social Security coverage and income for at least one wave of the panel, and all having indicated that they garnered Social Security because they are disabled. According to the 2013 Annual Statistical Supplement of the Social Security Administration, there were 8.8 million DI worker beneficiaries in 2012, or 2.8% of the population. Finding a slightly larger DI share in the sample is expected because the SIPP oversamples low-income populations.

Of equal interest is not only finding individuals in the SIPP who are on DI, but being able to distinguish between those who are in the two-year wait for Medicare and those who are past it. The SIPP asks all respondents at what age Social Security Disability benefits first began. From this, combined with the survey year and year of birth, I can construct a variable of DI tenure in years.[5] For example, if an individual reports that DI began at 52, and they are currently 56, then DI tenure, as I have defined it, is four years.

Relying on a measure of tenure based on age means that I lose precision in capturing Medicare eligibility. I only know that it occurs 24 months since DI benefits began, or sometime during the second year of DI tenure. For an individual who was awarded DI the day before her 30th birthday, the age awarded is technically 29. When she is 31, she is in her second year of DI tenure, but is actually only 366 days from award date, and still 364 days from being eligible for Medicare. Alternatively an individual awarded DI on their 30th birthday will be eligible for Medicare when he is 32, and the year-increment captures his eligibility perfectly. Individuals in the sample fall somewhere between these two extremes.

Although a determination of Medicare eligibility from a tenure calculation is not exact, it has its advantages over relying on the number of months observed in the survey on DI to calculate the first

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[4]The SIPP asks about Social Security in several parts of the survey. To be counted as a Social Security recipient in this paper, individuals had to indicate that they had Social Security in three variables: coverage, income, and benefits.

[5]Some individuals reported multiple ages in different waves as the age DI first began. To be consistent, the youngest age provided was used.

Medicare eligible month for each individual. With a panel set, it is ostensibly true that if individuals are observed for 48 months, then the data should show their linear progression—leaving work, attaining DI benefits, and then Medicare coverage. But in practice, the individual observations, or the individual's progression, are not that neat. As noted earlier, DI's work incentives include immediate return to the program and maintained Medicare benefits. Hence, recipients could be returning to DI after short periods of work activity, rather than beginning for the first time. If they have left, they could have Medicare benefits already. Or, they could be eligible for Medicare before the two-year mark due to statute exceptions for certain diseases. And it must be considered that the time span of the SIPP is relatively short. The advantage of using the age calculation is that it is straightforward and constructed identically for each individual, without bias in how month zero of DI was determined and simultaneously relying on fewer assumptions.

For the health insurance dependent variables, the SIPP asks directly if an individual had Medicare in a given month, Medicaid in a given month, and if they had any form of coverage that was not Medicare or Medicaid. There are four categories of non-Medicare, non-Medicaid insurance: employer- or union-sponsored insurance (ESI), privately purchased insurance, military coverage or a residual 'other.' 'Other' is a small share of the sample (1.25%), and is ignored. An indicator for the uninsured is constructed from negative responses to all insurance questions, and excludes any individual with a non-response for any category. The SIPP also asks about the owner of the non-Medicare, non-Medicaid coverage, whether it is the individual or another person. From these questions, I can define the eight dependent variables: Medicare, Medicaid, military coverage, ESI, two sub-categories of ESI (owned by the individual or owned by another person), privately purchased insurance, and uninsurance.

Sample means

The sample means and standard deviations of demographic characteristics, educational attainment, program participation, and health coverage of the sample are presented in Table 1. The unit of comparison is individuals' status at time of interview; it captures both the number of people and, more relevant for the program participation and health coverage variables, the frequency of the characteristic. The table compares three time periods: the first two years of DI, during which individuals are not eligible for Medicare (column 1), 2 years since DI began, the year in which DI recipients become Medicare eligible (column 2), and the first four years of Medicare eligibility (column 3). Individuals can be counted in multiple columns.

The demographic and educational attainment characteristics of individuals on DI vary little over the first six years of the program. All three show a slightly higher share of males (52.9%, 50.3%, and 52.9%), an outsized representation of black (19.0%, 20.5%, and 17.2%) and Hispanic (11.9%, 11.1% and 14.1%) individuals, and a low share of college graduates (11.9%, 11.7% and 12.2%). Individuals less than two years on DI are slightly younger (50.1 years old) than individuals more than two years (51.4 and 51.9

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years old), but began DI at slightly older ages (49.4 years old compared to 49.4 and 47.3 years old). Participation in means tested programs in the first six years of Disability Insurance suggests that the DI population grows poorer over time, or that individuals who start DI at younger ages are relatively poorer. The share of individuals on Food Stamps declines, from 23.5%, to 25.6%, to 21.8%, but the share on SSI increases, from 14.1%, to 16.6%, to 16.7%.

Health coverage in the Medicare waiting period is dominated by Medicaid, which covers 33.1% of individuals on DI in that 24 months. Somewhat surprisingly, 22.7% report Medicare in the first two years of DI, when they are still in the waiting period for Medicare eligibility. There are three possible explanations for this. First, individuals have Medicare in the waiting period because they are returning to DI and retained Medicare coverage or they have an illness which qualifies them for an exception to the waiting period (kidney failure and ALS). Second, individuals have Medicare but are misclassified into the waiting period. Remember that DI tenure was constructed using the individual's reported starting age, but individuals could be interpreting that question differently, giving the time they became disabled instead of the time that the disability payments began.[6] Last, individuals could be misreporting Medicare, as it is possible to confuse Medicare with Medicaid.

Together with military coverage, these means imply that over half the individuals who are on DI and in the waiting period for Medicare already have public coverage. Only 29.2% have employer-sponsored coverage, which is split fairly evenly between plans that are owned by another person (14.6%) and plans that are owned by the disabled individual (14.1%). A small share (7.9%) have privately purchased coverage. A full fifth (21.8%) are uninsured.

After the two-year mark, though, the composition of health coverage in the DI population changes considerably. In column 3, Medicaid and military coverage is roughly constant, at 33.4% and 3.3%, respectively. But Medicare jumps almost 50 points to 70.7%, employer-sponsored plans fall to 23.2%, with a larger decline in plans owned by the disabled individual, which fall from 14.1% to 9.5%, compared to the relatively steady plans owned by another individual, which fall from 14.6% to 13.5%. Privately purchased coverage ticks up from 7.9% to 9.7%, and there is a large drop in uninsured, to 5.8%. Figures 1 - 8 show the means for all individuals in the sample of each type of health coverage over the first six years of Disability Insurance.

IV. Model, Results, and Robustness

Model and Results

The model used to study the effect of Medicare eligibility on health insurance coverage is an event

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[6]Applicants to Disability Insurance indicate when their work-preventing illness began, the alleged onset date (AOD). When approved for benefits, the examiner determines when the illness began, an established onset date (EOD). DI benefits begin with application approval, but include a one-time, lump-sum payment for all months since EOD, less five months.

study.

$$y_{it} = X'_{it}\beta + \sum_{j=2}^{6} \gamma_j D_{it} + \theta_i + \epsilon_{it} \tag{1}$$

The key variable of interest is D_{jit}, where j is the number of years since DI began, i is the individual, and t is the time period. This means that each year an individual is on DI is considered a separate treatment relative to the omitted year one, captured with γ_j; year three is the first full year of Medicare eligibility. As mentioned previously, the eight types of insurance comprise the dependent variables y_{it}. The dependent variable is binary, equal to 1 if the individual indicated coverage at time of interview and 0 if not. An individual can have more than one type of coverage in any time period. The covariates X_{it} include family income, marital status, age, family size, as well as year effects, while the individual fixed effects θ_i include race, ethnicity, age DI began, educational attainment and any other unobserved, time-invariant heterogeneity.

Table 2 shows the event study results from an OLS panel regression with robust standard errors. The year coefficients, γ_j's, are not cumulative over time; each year's coefficient is relative to the omitted year one. Medicare coverage in column 1 begins to increase in year two, with a coefficient of 0.067. As noted in the previous section, individuals on DI should become eligible for Medicare at some point in their second year; the mitigated change in the coefficient on Medicare in year two is reflecting that. In year three, the first full year of Medicare eligibility, the coefficient increases to 0.183, or a 18.3 percentage-point increase in Medicare coverage. Although this seems an obvious point, that Medicare eligibility increases Medicare coverage, it signifies that the model, which due to data limitations approximates Medicare eligibility using length of time on DI, is effective.

Further internal robustness checks to the model come from Medicaid in column 2 and military coverage in column 3. Medicaid has small increases in years two and three (0.023 and 0.018), but nothing concentrated year three. Military coverage has no significant change, and produces coefficients near zero (0.002 and -0.002). These two public insurance programs are not a choice in the way that private insurance, or uninsurance, is. Eligibility for public insurance coverage is rule-based and defined by the government. In the third year, there is only a rule change for Medicare; any significant change in Medicaid or military coverage would cast doubt on what the model is finding. Together, the results for the three public health programs establish that using DI tenure to proxy for Medicare eligibility is appropriate.

Employer-sponsored coverage in column 4 is lower in each year of the event study relative to coverage in year one. The decline is larger in year two (-0.053) than in year three (-0.040), and the results in column 5 indicate that the drop overall is attributable to the decline in self-owned plans which are owned by the disabled individual (-0.043 and -0.032). Year three is of no importance to the decrease in ESI coverage and, given that each coefficient is relative to the omitted year, the smaller coefficient in year three would suggest that ESI increases slightly. In addition, ESI plans that cover the DI recipient but

are owned by another individual in column 6 have small declines in years two and three (-0.010 and -0.005), and none significant. One could argue that because private insurance plans are on fixed-term contracts, the effect of Medicare eligibility on ESI coverage would be delayed, as individuals have to wait for plans to expire, implying that year four is the year of interest. In that year, both ESI owned by the disabled individual and ESI owned by another person see larger drops than in year three, of -0.042 and -0.014 respectively.

Purchased insurance in column 7 seems to uptick slightly, though not significantly, over the start of Medicare eligibility, reaching 0.007 in year two and 0.009 in year three. Last, in column 8, the effect of Medicare eligibility on uninsurance is clear and large. Starting with a small decline in year two (-0.010), uninsurance falls in year three -0.065, or 6.5 percentage-points relative to year one. This drop is sustained for the remainder of the event study. The γ_j coefficients for uninsurance also provide a base of comparison for employer-sponsored insurance, and how Medicare's effect should look were crowd out of private coverage occurring. That is, uninsurance falls in step with the timing of Medicare eligibility. If Medicare was crowding out private coverage, we would expect the results in columns 4 - 7 to look like uninsurance in column 8, but they do not.

Table 3 offers a different perspective, presenting the same model but with alternate dependent variables. The dependent variables were constructed in Table 2 to allow for individuals to have multiple forms of coverage. Table 3 restricts this so that an individual can only have one type of coverage at any time. There are five types of single coverage: Medicare only, Medicaid or military only, ESI owned by the disabled individual only, ESI owned by another individual only, and purchased only; two types of double coverage: Medicare in addition to either Medicaid or military coverage, and Medicare, Medicaid, or military coverage in addition to any type of private coverage; uninsurance is unchanged. The γ_j coefficients across dependent variables in a single year sum to zero. Figure 9 shows means of coverage types by DI tenure, which, now that they are mutually exclusive and exhaustive, sum to one.

Medicare in isolation in column 1 increases with the timing of Medicare eligibility in year three, but this coefficient (0.076) is less than half the size as before when looking at Medicare in conjunction with over coverage (0.183) in Table 2. The reason for the smaller impact on Medicare can be drawn from columns 6 and 7, which shows a coincidental and even larger increase in double coverage of both kinds in year three, 0.055 for double public coverage and 0.046 for double public and private coverage, which are much larger than the increases in year two, 0.019 and 0.009 respectively. The declines in Medicaid, military, self-owned ESI, other-owned ESI and purchased insurance in columns 2 - 5 are also partly explained by increases in columns 6 and 7. Individuals already on public programs are moving to double coverage, but so are individuals with private insurance.

The upshot of the mutually exclusive and exhaustive dependent variables is to document the increase in double coverage, but an additional benefit is that they allow for preliminary math of crowd out estimation. For example, if we assume that individuals who are no longer uninsured in year three (a

0.065 decline) gain Medicare and no other type of coverage (a 0.076 increase), then the reduction in uninsured accounts for 85% of the increase in Medicare in isolation. We can also make comparisons between Tables 2 and 3. In Table 2, coverage declines if individuals no longer have that coverage, but in Table 3, it declines if individual no longer have that coverage *or* if they gain another type of coverage. Starting with ESI owned by the disabled individual, it declined in year three -0.032 in Table 2 and -0.039 in Table 3. This implies that only 18% of the drop in self-owned ESI in isolation was a move to double coverage, most of the decline can be explained by dropped or lost coverage. For ESI owned by another individual, this is reversed, 81.5% of the drop in other-owned ESI in isolation was a move to double coverage, with a smaller share explained by dropped or lost coverage. The effect of Medicare eligibility on employer-sponsored coverage clearly differs based on the owner of the plan. If the disabled individual owns the plan, they are more likely to drop coverage, if another individual owns the plan, they are more likely to keep it and maintain double coverage.

Robustness

The event study relied on certain assumptions that I will relax in various robustness checks. A summary of these checks is shown in Table 4. Panel A shows the overlapping dependent variables and Panel B shows the mutually exclusive and exhaustive dependent variables. Each line is a summary of a robustness check, performed for each set of variables. Complete results can be found in Tables i.-x. of the Appendix.

To start, the SIPP is a four-year panel, but the event study includes regressors out to years four, five, and six of DI tenure. This means that the individuals who were observed in years five and six could not have been observed in years one and two. The model is making a comparison of year six relative to year one, when the individuals who had variation in the dependent variables to produce those estimates cannot be the same people. Presenting them in a single table assumes that the only difference between the two groups of individuals are that they were observed at different times of DI tenure, and any other differences can be explained by the model. This is a strong assumption. There is selection into later years of DI tenure because in order to get to year six, individuals had to both stay alive and not return to work. Moreover, the results in Tables 2 and 3 indicate that something problematic is occurring because in both tables, the coefficients in years five and six are smaller than years three, predicting declines in Medicare and increases in ESI over time.

To check that the observations from later years of tenure are not influencing the main result, I rerun the model with a smaller sample, limited to only those individuals who were observed becoming Medicare eligible. This reduces the sample to 526 individuals. Year one is still the omitted year of comparison. The results for the year three coefficient, γ_3, are shown in line 2 of Table 4. The internal robustness from the larger sample again holds for the overlapping variables in Panel A—the Medicare coefficient shows an increase in year three (0.220), while Medicaid and military have small and insignificant changes (-0.012

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and -0.001)—from which we can conclude that even with the smaller sample, the model is capturing Medicare eligibility. Comparing these results to those in Table 2, some interesting differences emerge. The size of the Medicare increase and uninsurance decline are larger in the restricted sample, Medicare's coefficient is 0.220, compared to 0.183 in the larger sample, while uninsurance declines -0.108, compared to -0.065 in the larger sample. The declines in private coverage are smaller for ESI overall and ESI owned by another individual, while ESI owned by the disabled individual surprisingly shows a slight increase. Lastly, privately purchased insurance shows a large and significant increase in year three, up 0.041, perhaps reflecting that individuals are purchasing private plans that are designed to complement Medicare.

The exhaustive categories in line 2 of Panel B of Table 4 are similar to Table 3, but again the coefficients are larger in the restricted sample than in the full sample. Medicare in isolation increases 0.090, double public coverage increases 0.053, and double private coverage increases 0.071 in year three. ESI owned by another indidual is more consistent between the two sample sizes, declining -0.026, compared to -0.027 in Table 3. But again, ESI owned by the disabled individual shows a slight increase in year three, quite at odds with the -0.039 decline in Table 3.

Although there are differences between the sizes of coefficients, there is strong consistency between the full and reduced samples in the drop in uninsurance and increase in double coverage in year three of DI tenure. Harder to reconcile is employer-sponsored coverage. ESI owned by another individual again produces null results, suggesting that if there is crowd out, it is very limited. But the large and significant decline in Tables 2 and 3 in self-owned plans turn to small increases in the reduced sample. In addition, the small increase in purchased insurance gains size and significance in the smaller sample. The narrow scope of this robustness check—looking only at individuals who are observed becoming Medicare eligible—lends more weight to the conclusion that Medicare eligibility induces a drop in uninsurance and increase in double coverage, without clear crowd out of private coverage. The larger increase in purchased insurance would even suggest that Medicare encourages private coverage. It could be that individuals seek out new private coverage, or individuals with comprehensive employer plans switch to Medicare and a complementary private plan. No conclusions on that front are possible in this study.

Both the larger and restricted sample use individual fixed effects, which assumes that if there is unobserved heterogeneity in the sample, it is within and not between individuals and, more importantly, that it is constant over time. This is a strong assumption considering that the population of interest are either the chronically sick and dying, whose conditions might be deteriorating, or the acutely and temporarily ill, whose conditions might be improving. Although the OLS panel regression includes covariates to control for calendar year and tenure, there is an argument that fixed effects are too restrictive in their assumptions about unobserved heterogeneity, and that random effects would be more appropriate. To account for this, I use random effects instead of fixed effects for both the full and reduced sample for both sets of dependent variables. Note that this means that certain covariates are added to the regression,

including age DI began, race, educational attainment, and gender. Regardless, the coefficients produced with random effects are extremely similar in size to those produced with fixed effects, and do not differ from them in any significant way, as shown in lines 3 and 4 of Panels A and B of Table 4.

There is a larger concern with the event study, aside from the assumptions used to construct it, that arises from using a linear probability model with a binary dependent variable. Although the results are more easily interpretable, a linear probability model does not constrain the probability to exist between 0 and 1, and the model could produce nonsense results. For that reason, I also test two logit models on the two sets of dependent variables. The first is a fixed effect logit regression, carrying over the assumption on observed heterogeneity that was used in the original model. The coefficients (log odds) are shown in lines 5 of Panels A and B of Table 4. Fixed effect logits remove from the sample any individual that does not observe a change in the dependent variable, causing varying reductions in sample size in the spirit of the first reduced sample robustness check. Another departure from the event study is the independent variable of interest—rather than use specific years of DI tenure, the logit uses a dummy variable indicating whether an individual has been on DI for more than two years, approximating full Medicare eligibility.

The results in line 5 of Table 4 complement the findings from the event study well: in Panel A, the largest coefficients are those that predict Medicare's increase (2.620) and the decline in uninsurance (-2.242). Self-owned ESI has a large decline (-1.212), while other-owned ESI's decline is near zero (-0.088) and purchased has a small increase (0.530). When looking at the mutually exclusive and exhaustive variables in Panel B, again Medicare's increase is dampened in isolation (1.468), due to the large increases in double public and double public and private coverage (1.851 and 1.504).

Finally, I relax the unobserved heterogeneity assumption of the fixed effect logit and instead use a multinomial logit, which ignores the panel aspect of the data, but clusters errors by individual. The results are shown in line 6 of Table 4. They are similar to the fixed effect logit, and hence also complementary with event study analysis.

The final robustness check, which is not shown in the tables, concerns the sample and the ability to capture Medicare eligibility through DI tenure. Recall from Table 1 that 22.7% of individuals reported Medicare coverage during the first two years of DI. Although individuals could have Medicare in that time period if they had ALS or kidney failure, or were returning from DI, it is unlikely that this could account for over a fifth of individuals. This high mean for Medicare during the waiting period is tantamount to a litmus test of my capturing of the waiting period. My analysis and robustness, as presented in tables 2 - 4, included them in the sample, implicitly assuming that those individuals, even though they had already received the treatment of Medicare eligibility, would not influence my study of the treatment affect. If these individuals are removed from the sample and the same event study and robustness checks are pursued, it does not alter the results in any significant way.

V. Discussion and conclusion

The results from the event study and various robustness checks point to three main conclusions that can be drawn from the study of the health insurance coverage of the DI population as it transitions to Medicare eligibility. The first two are consistent across assumptions and specifications: Medicare eligibility is coincidental with a large decline in uninsurance and increase in double coverage. The third conclusion is a null result, that there is no discernible crowd out of the three types of private coverage studied. Self-owned ESI, or employer coverage that is owned by the disabled individual, showed large declines or small increases, depending on the assumption. It is clear from the means shown in Table 1 and Figure 6 that this form of coverage is unequivocally declining for the DI population, but the results were not able to produce consistent evidence that Medicare eligibility causes or accelerates that decline. Other-owned ESI, or employer coverage that is owned by another person but covers the disabled individual, does decrease a small amount. There is an argument that crowd out of this type of coverage is delayed and occurs two years after eligibility is introduced, after contracts have had time to expire. However, even if all of the decline was attributed to Medicare, it is relatively small, and much smaller than crowd out estimates in the literature. On top of that, private insurance purchased directly from the insurer shows slight increases.

As noted in the introduction, this is a population that, in general, is transitioning from employment and wages to recipiency and cash transfer. This paper documents one part of the concurrent transition from private insurance to public health coverage. The findings suggest that this process is inefficient. Not only are there gaps in coverage, but there are large increases in double public coverage and double private coverage, which suggests a narrative that individuals on DI secure all the health coverage they can for as long as they can. Although the DI population is small and the waiting period policy is unique to them, this inefficiency in delivery of coverage is still notable. From the perspective of the health insurance system, the DI population approximates a very important group—the chronically sick and dying. This analysis is relevant because it studies the most expensive users of the health care system, users whose coverage should be both seamless and efficiently allocated. If the specific findings of this paper are the effects on uninsurance and double coverage, the broader finding is that both of these point to larger efficiency issues in coverage delivery.

The implications of these efficiency issues bring me back to the motivations for this analysis. First, in regards to the consequences of Medicare cost saving, the results of this paper call into question just how clear cut that cost savings is for the federal government. Card et al. (2008), Card et al. (2009), Meyer and Wherry (2012), and Currie and Gruber (1996) show in their studies improved health outcomes and mortality rates as a result of Medicare and Medicaid coverage. The two-year waiting period for the DI population could be counter productive in its cost saving achievements if the main result of the waiting period, because of uninsurance documented in this analysis, was to make individuals comparatively less healthy, so that by the time they are brought in to public coverage, they are more expensive to cover.

Or if it alters their health consumption behavior so that, while Medicare might be saving money from not covering the population for two years, other health providers with less resources than Medicare, such as public hospitals and community health centers, are bearing the costs instead. In a similar vein, there is an added cost to the federal government if it is further shown that as a result of this uninsurance, individuals have worse financial outcomes. SSI and Medicaid are safety nets for the DI population which is also very poor. The two-year policy would be counter productive to cost saving if individuals used their retirement savings to cover medical costs, or even manipulated their work behavior, or marital status, to reduce their income, thereby accelerating their eligibility for SSI and Medicaid. This paper motivates a similar study on the health behavior and outcomes and financial security of the DI population during and after the Medicare waiting period.

As to the second motivation, the role of the waiting period as a work incentive or disincentive for the DI population, this paper's documentation of gaps in coverage and multiple forms of coverage should be considered as a possible influence on work and work search behavior. Individuals could be motivated to find work in order to secure coverage, or could be hindered in finding work because they must secure coverage, or have a private source of coverage, and are insulated from the health insurance motivation entirely when making a work decision. This paper motivates additional research on the work behavior of DI recipients or possible recipients should that take into account the insurance status incentives that could exist to motivate or hinder their return.

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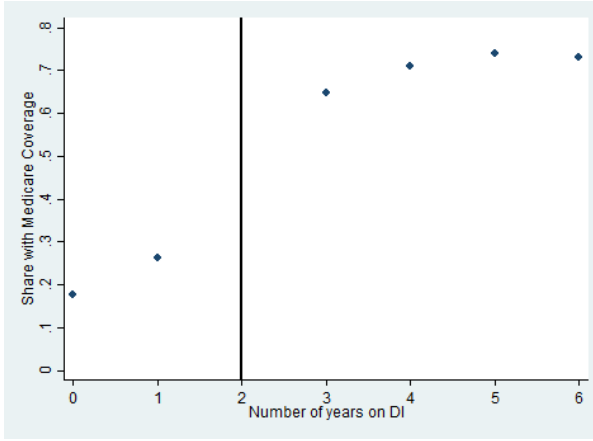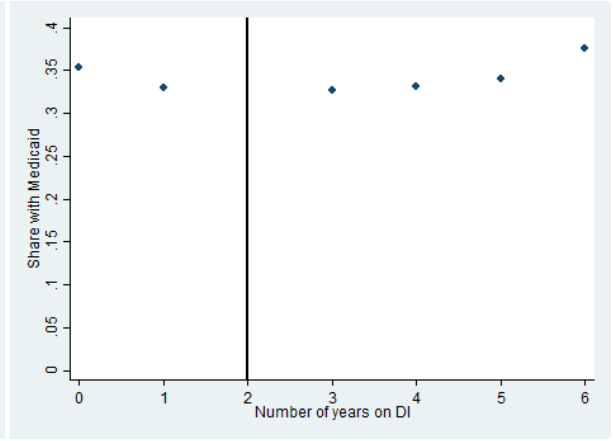
Figure 1: Medicare
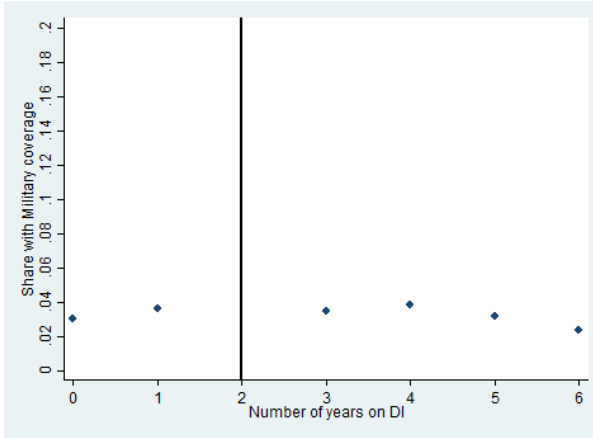

Figure 2: Medicaid
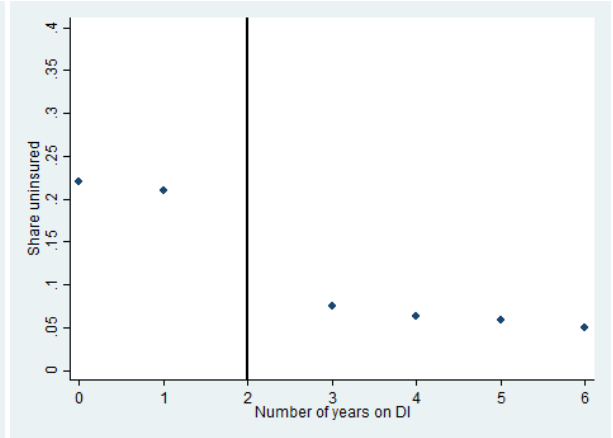

Figure 3: Military

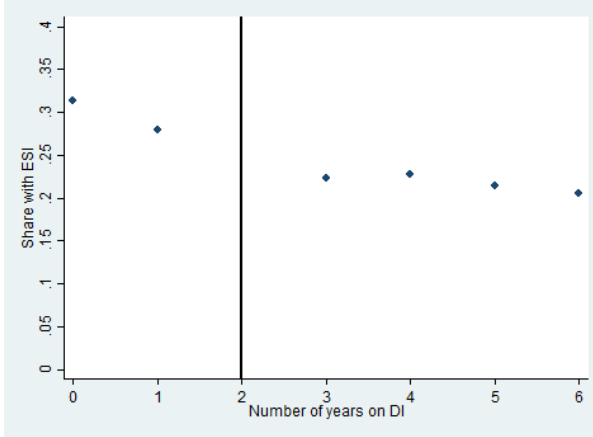Figure 4: Uninsured

Figure 5: ESI
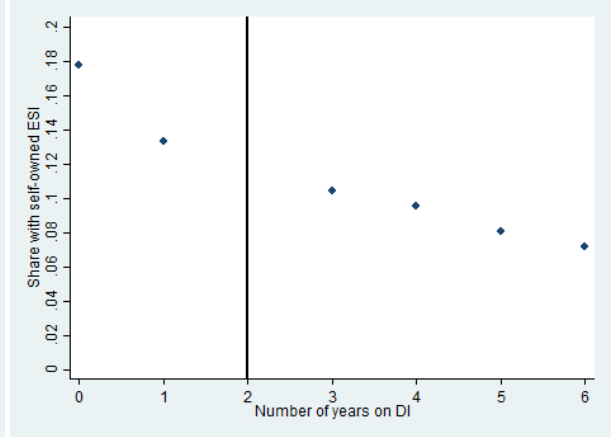

Figure 6: ESI, owned by the individual

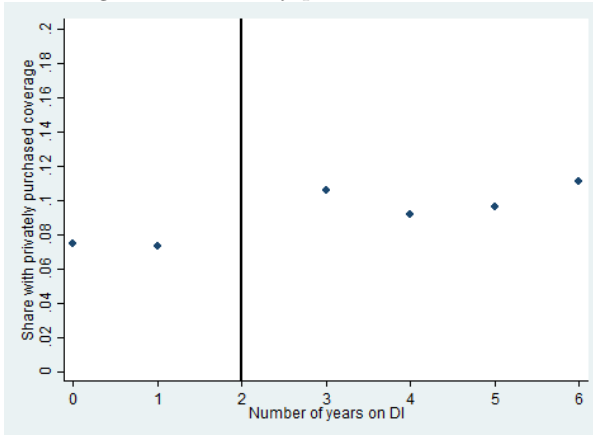Figure 7: Privately purchased insurance

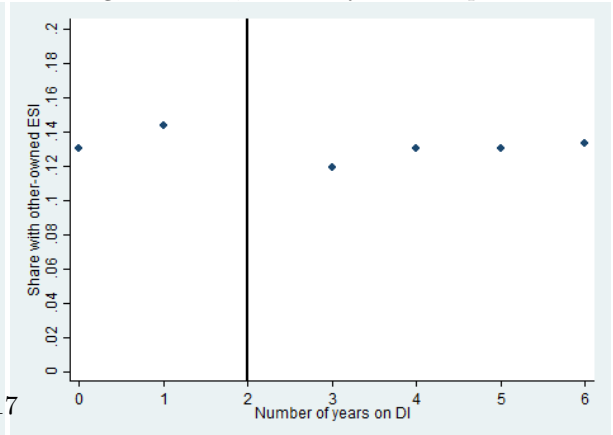Figure 8: ESI, owned by another person

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Figure 9: Health insurance coverage of DI recipients, by length of time in program.
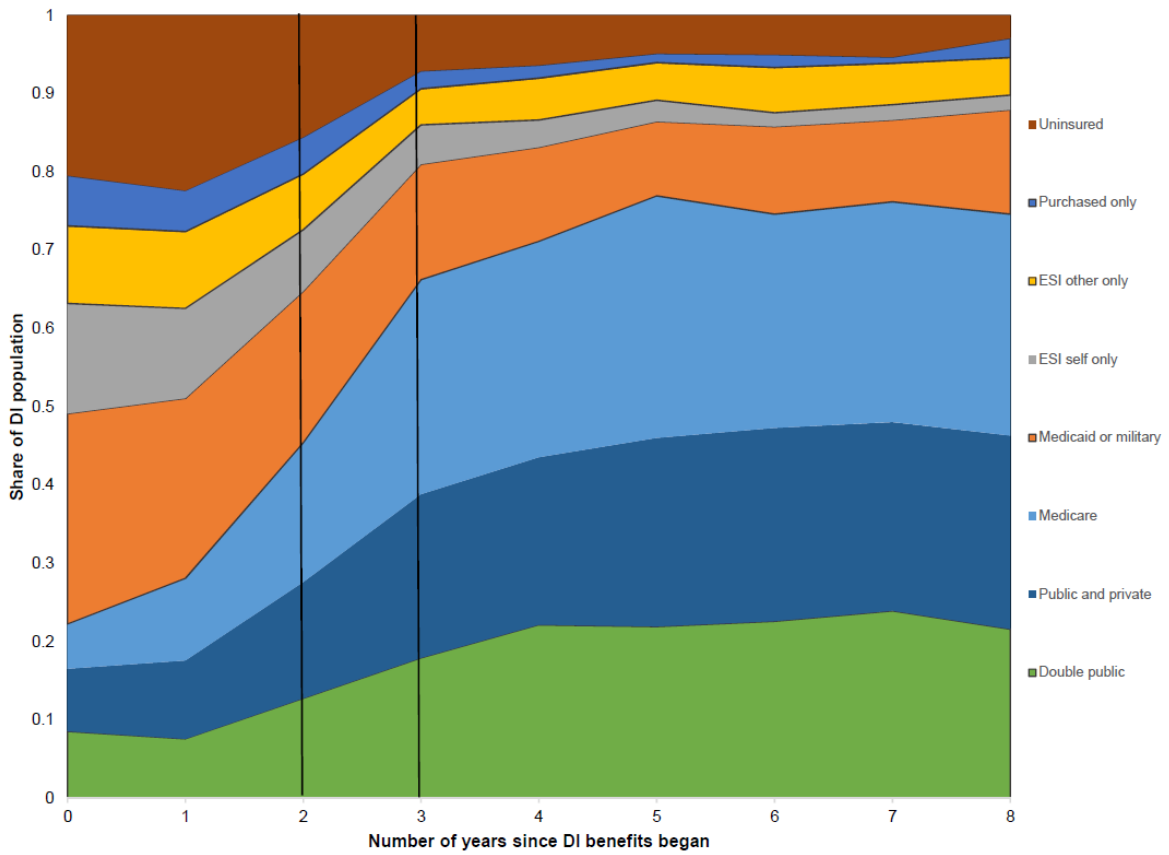
Table 1. Sample means of demographic, educational attainment, program participa-
··tion, and insurance variables by DI tenure.

	(1) Medicare Wait 0-1 year N=829		(2) Transition 2 years N=762		(3) Medicare Eligible 3-6 years N=1537	
Years on DI	Mean	SD	Mean	SD	Mean	SD
Demographics						
Age DI began	49.4	12.687	49.4	11.470	47.3	11.335
Current age	50.1	12.712	51.4	11.470	51.9	11.276
Male	52.9%	0.499	50.3%	0.500	52.9%	0.499
Black	19.0%	0.393	20.5%	0.404	17.2%	0.378
White	75.5%	0.43	74.2%	0.438	76.5%	0.424
Hispanic	11.9%	0.324	11.1%	0.314	14.1%	0.348
Asian	2.2%	0.147	2%	0.140	2.1%	0.142
Married	44.4%	0.497	44.5%	0.497	47.2%	0.499
Divorced or Separated	26.9%	0.443	25%	0.433	24.9%	0.432
Family Size	2.4	1.531	2.5	1.546	2.4	1.471
Education						
Less than high school	14.0%	0.347	12.1%	0.327	14.2%	0.349
High school	33.3%	0.471	34.5%	0.476	34.5%	0.475
Some college	33.6%	0.472	32.8%	0.470	32.3%	0.468
Bachelor's or higher	11.9%	0.323	11.7%	0.322	12.2%	0.327
Income and Programs						
Any paid employment	12.8%	0.334	9.6%	0.294	9.9%	0.299
Family monthly income	3,612	3,664	3,573	3,344	3,460	3,200
Food Stamps	23.5%	0.424	25.6%	0.437	21.8%	0.413
Other need-based assistance)	6.3%	0.242	7.4%	0.262	7%	0.255
Federal SSI	14.1%	0.348	16.6%	0.373	16.7%	0.373
State SSI	1.6%	0.126	1.9%	0.136	2.5%	0.156
Health Coverage						
Medicaid	33.1%	0.471	31.9%	0.466	33.4%	0.472
Medicare	22.7%	0.419	43.2%	0.495	70.7%	0.455
Military coverage	3.5%	0.183	3.5%	0.185	3.3%	0.178
ESI	29.2%	0.455	25.2%	0.434	23.2%	0.422
ESI, owned by other	14.6 %	0.353	12.7%	0.333	13.5%	0.342
ESI, owned by self	14.1%	0.348	12.1%	0.326	9.5%	0.294
Privately Purchased	7.9%	0.27	9.6%	0.294	9.7%	0.297
Uninsurance	21.8%	0.413	15.5%	0.362	5.8%	0.234

Notes: Table presents the mean of individuals observed in the data at the time of interviews; for
health coverage variables, individuals reporting multiple types of coverage are reported for every
type. It is possible that an individual was uninsured, has private coverage, and then Medicare, or
··even double coverage; that individual would be included in the averages of each.
†Other need-based assistance includes transportation, clothing, food, childcare, welfare, and WIC.
‡Some states choose to augment Federal Supplemental Security Income with their own State
Supplemental Security Income. It does not affect Medicaid eligibility.

Table 2. Results from panel regression event study with individual fixed effects and robust standard errors on eight
dependent variables measuring health insurance.

	(1) Medicare	(2) Medicaid	(3) Military	(4) ESI	(5) ESI (self)	(6) ESI (other)	(7) Purchased	(8) Uninsurance
Year two	0.067***	0.023**	0.002	-0.053***	-0.043***	-0.010	0.007	-0.010
	[0.016]	[0.010]	[0.005]	[0.011]	[0.010]	[0.007]	[0.009]	[0.012]
Year three	0.183***	0.018	-0.002	-0.040***	-0.032***	-0.005	0.009	-0.065***
	[0.017]	[0.013]	[0.005]	[0.011]	[0.009]	[0.008]	[0.010]	[0.010]
Year four	0.162***	0.026**	-0.000	-0.056***	-0.042***	-0.014**	0.002	-0.050***
	[0.015]	[0.012]	[0.005]	[0.011]	[0.009]	[0.007]	[0.010]	[0.010]
Year five	0.157***	0.001	-0.003	-0.041***	-0.033***	-0.009	-0.003	-0.044***
	[0.014]	[0.012]	[0.004]	[0.009]	[0.008]	[0.007]	[0.009]	[0.009]
Year six	0.107***	0.023**	-0.008**	-0.030***	-0.019***	-0.007	0.010	-0.038***
	[0.016]	[0.012]	[0.004]	[0.009]	[0.007]	[0.007]	[0.010]	[0.008]
Married	-0.020	-0.002	0.001	0.089***	0.017	0.071***	0.011	-0.048**
	[0.024]	[0.022]	[0.006]	[0.023]	[0.019]	[0.018]	[0.013]	[0.021]
Divorced/separated	-0.002	-0.015	0.003	-0.004	0.006	-0.008	0.005	0.020
	[0.024]	[0.020]	[0.005]	[0.016]	[0.015]	[0.009]	[0.013]	[0.017]
Family size	0.004	-0.004	-0.003*	-0.003	-0.004	-0.000	0.003	0.003
	[0.005]	[0.004]	[0.001]	[0.004]	[0.003]	[0.003]	[0.003]	[0.004]
Federal SSI	-0.014	0.469***	-0.001	-0.040***	-0.026***	-0.013***	0.001	-0.116***
	[0.011]	[0.012]	[0.002]	[0.006]	[0.005]	[0.004]	[0.005]	[0.007]
Family income†	0.003**	-0.002***	0.000	0.010***	0.007***	0.002***	-0.000	-0.005***
	[0.001]	[0.001]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Year effects‡	Y	Y	Y	Y	Y	Y	Y	Y
N	6,303	6,303	6,303	6,303	6,303	6,303	6,303	6,303

Notes: Table presents eight OLS panel regression results. Individuals may have multiple forms of coverage. ESI, self and ESI, other are subcategories
of ESI.
†Monthly family income from any source/$1000.
‡Calendar year of the interview, 2008-2012.

Table 3. Results from panel regression event study with individual fixed effects and robust standard errors on mutually exclusive and exhaustive variables measuring health insurance.

	(1) Medicare only	(2) Medicaid or military only	(3) ESI, self only	(4) ESI, other only	(5) Purchased only	(6) Medicare and other public	(7) Public and private	(8) Uninsurance
Year two	0.039***	0.006	-0.044***	-0.021***	0.010	0.019**	0.009	-0.010
	[0.012]	[0.012]	[0.010]	[0.008]	[0.007]	[0.009]	[0.011]	[0.012]
Year three	0.076***	-0.036***	-0.039***	-0.027***	-0.008	0.055***	0.046***	-0.065***
	[0.014]	[0.012]	[0.009]	[0.008]	[0.006]	[0.012]	[0.013]	[0.010]
Year four	0.069***	-0.025**	-0.049***	-0.027***	-0.004	0.058***	0.026**	-0.050***
	[0.014]	[0.010]	[0.008]	[0.007]	[0.005]	[0.013]	[0.013]	[0.010]
Year five	0.087***	-0.032***	-0.040***	-0.024***	-0.010**	0.033***	0.029**	-0.044***
	[0.013]	[0.010]	[0.006]	[0.007]	[0.005]	[0.011]	[0.012]	[0.009]
Year six	0.054***	-0.013	-0.030***	-0.011	-0.006	0.024*	0.030**	-0.038***
	[0.014]	[0.011]	[0.005]	[0.007]	[0.005]	[0.012]	[0.012]	[0.008]
Married	-0.024	0.023	-0.001	0.038***	0.014	-0.037**	0.048**	-0.048**
	[0.021]	[0.021]	[0.017]	[0.013]	[0.010]	[0.017]	[0.019]	[0.021]
Divorced/separated	-0.012	0.007	-0.016	-0.010	0.013*	-0.007	0.016	0.020
	[0.020]	[0.019]	[0.013]	[0.007]	[0.007]	[0.018]	[0.016]	[0.017]
Family size	0.000	-0.004	-0.003	0.001	0.001	0.003	0.001	0.003
	[0.004]	[0.004]	[0.003]	[0.003]	[0.002]	[0.004]	[0.004]	[0.004]
Federal SSI	-0.172***	0.159***	-0.043***	-0.038***	-0.015***	0.173***	0.059***	-0.116***
	[0.008]	[0.011]	[0.004]	[0.005]	[0.003]	[0.010]	[0.008]	[0.007]
Family income†	-0.001	-0.003***	0.005***	-0.000	0.000	0.000	0.004***	-0.005***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]	[0.001]	[0.001]
Year effects‡	Y	Y	Y	Y	Y	Y	Y	Y
N	6,303	6,303	6,303	6,303	6,303	6,303	6,303	6,303

Notes: Table presents eight OLS panel regression results. Individuals may not have multiple forms of coverage. Public and private includes any combination of Medicare or Medicaid or military coverage with ESI or purchased insurance.
†Monthly family income from any source/$1000.
‡Calendar year of the interview, 2008-2012.

..Table 4. Summary of results from various robustness checks.

A.	(1) Medicare	(2) Medicaid	(3) Military	(4) ESI	(5) ESI (self)	(6) ESI (other)	(7) Purchased	(8) Uninsurance
1. Initial results	0.183***	0.018	-0.002	-0.040***	-0.032***	-0.005	0.009	-0.065***
(Table 2)	[0.017]	[0.013]	[0.005]	[0.011]	[0.009]	[0.008]	[0.010]	[0.010]
2. Restricted sample, FE	0.220***	-0.012	-0.001	-0.009	0.003	-0.007	0.041*	-0.108***
	[0.028]	[0.021]	[0.008]	[0.020]	[0.014]	[0.015]	[0.022]	[0.019]
3. Full sample, RE	0.181***	0.021*	-0.002	-0.042***	-0.033***	-0.006	0.009	-0.065***
	[0.016]	[0.013]	[0.005]	[0.011]	[0.009]	[0.008]	[0.010]	[0.010]
4. Restricted sample, RE	0.232***	-0.012	-0.001	-0.011	0.001	-0.008	0.042*	-0.111***
	[0.028]	[0.021]	[0.008]	[0.020]	[0.014]	[0.015]	[0.022]	[0.019]
5. Fixed effect logit†	2.620***	0.354**	-0.278	-0.828***	-1.212***	-0.088	0.530***	-2.242***
	[0.111]	[0.138]	[0.289]	[0.145]	[0.183]	[0.212]	[0.156]	[0.173]
6. Multinomial logit‡	1.703***	0.126***	-0.214***	-0.275***	-0.371***	0.007	0.106**	-1.424***
	[0.031]	[0.037]	[0.078]	[0.037]	[0.045]	[0.047]	[0.051]	[0.044]

B.	Medicare only	Medicaid or military only	ESI, self only	ESI, other only	Purchased only	Medicare and other public	Public and private	Uninsurance
1. Initial results	0.076***	-0.036***	-0.039***	-0.027***	-0.008	0.055***	0.046***	-0.065***
(Table 3)	[0.014]	[0.012]	[0.009]	[0.008]	[0.006]	[0.012]	[0.013]	[0.010]
2. Restricted sample, FE	0.090***	-0.063***	0.015	-0.026*	-0.024**	0.053**	0.071***	-0.108***
	[0.029]	[0.022]	[0.015]	[0.015]	[0.012]	[0.025]	[0.027]	[0.019]
3. Full sample, RE	0.075***	-0.033***	-0.040***	-0.027***	-0.007	0.055***	0.043***	-0.065***
	[0.014]	[0.012]	[0.009]	[0.008]	[0.006]	[0.012]	[0.013]	[0.010]
4. Restricted sample, RE	0.097***	-0.065***	0.012	-0.027*	-0.024**	0.056**	0.074***	-0.111***
	[0.029]	[0.022]	[0.015]	[0.015]	[0.012]	[0.025]	[0.027]	[0.019]
5. Fixed effect logit†	1.468***	-1.366***	-2.070***	-1.781***	-1.513***	1.851***	1.504***	-2.242***
	[0.120]	[0.135]	[0.246]	[0.264]	[0.282]	[0.149]	[0.126]	[0.173]
6. Multinomial logit‡	1.029***	-0.819***	-1.488***	-0.592***	-1.170***	0.994***	0.880***	-1.424***
	[0.041]	[0.038]	[0.061]	[0.060]	[0.080]	[0.046]	[0.043]	[0.044]

Notes: Table presents results from five robustness checks, each run on two definitions of the dependent variables. In panel A, individuals can have more than one type of coverage. In panel B, individuals can only have one type of coverage. FE denotes fixed effects, RE denotes random effects. Coefficient results shown are year three of DI tenure, unless otherwise noted, and regressions are panel regressions, unless otherwise noted.
†Coefficient shown is for dummy variable that takes on value of 1 if the individual has been on DI for more than two years.
‡Not a panel regression. Coefficient shown is for dummy variable that takes on value of 1 if the individual has been on DI for more than two years.