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WHAT EXPLAINS STATE VARIATION IN SSDI APPLICATION RATES?

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Abstract

Social Security Disability Insurance (SSDI) applications and receipts vary greatly by state. This paper investigates the extent to which this geographic variation in SSDI applications reflects differences in health, demographics, and employment characteristics, state policies, and politics. We find that demographic, health, and employment characteristics of the state have the greatest effect on state-level variations in SSDI application rates, explaining over 70 percent of the variation. State policy concerning mandated employer-sponsored disability insurance (also known as temporary disability insurance or TDI) has a small negative effect on overall SSDI applications. This finding supports the principle underlying many recent SSDI reform plans: temporary disability insurance coverage could save the SSDI program considerable funds in the long run. Further, when we look to explain variation within a state, we find that state changes in health insurance regulation are negatively correlated with the SSDI application rate. This could be an indication that the Affordable Care Act (ACA) may have spillovers to the SSDI program.

Introduction

Social Security Disability Insurance (SSDI) applications and receipts vary greatly by state (McVicar 2006; Bound and Burkhauser 1999; Rupp and Stapleton 1998), which has led to concerns about potential inconsistencies in the application of disability standards. This possibility has prompted numerous Congressional hearings and reports and led the Social Security Advisory Board (2001a; 2001b) to express concern about the Social Security Administration's (SSA) ability to disentangle the potential causes.

Much of the previous work focuses on the SSDI rolls, allowance rates or award rates; not as much attention has been paid to application rates (also referred to as filing rates) since Rupp and Stapleton (1998) summarized the known factors affecting caseloads.

Work by the Social Security Administration (SSA 1988) finds that economic and demographic differences are significant factors in explaining state SSDI application rates, but their sample lacks information about the underlying health of the population. Strand (2002) advances this work by adding some, albeit limited, health and health insurance information but also covers a very short time period (1997-1999). Duggan and Imberman (2009) explore the relationship between applications and the unemployment rate but do not control for other potentially confounding factors. [1]

While it is debated whether the overall growth in the SSDI rolls could be attributable to increased underlying disability,[2] clinical measures of health exhibit substantial state-level variation. For example, age-adjusted mortality rates are 25 percent higher in Mississippi and 22 percent lower in Hawaii than the U.S. average (National Center for Health Statistics 2010). Self-reported disability varies even more, even after controlling for individual characteristics (Subramanian, Kawachi, and Kennedy 2001), although this variability may in part reflect labor market conditions (Parsons 1982; Haveman, de Jong, and Wolfe 1991; Gruber and Kubik 1997; Currie and Madrian 1999; Bound and Burkhauser 1999). Variations in poverty rates between states also may lead to differences in the incidence of mental and physical impairment (McCoy, Davis, and Hudson 1994).

[1] See Rupp and Stapleton (1995) for a survey of earlier studies estimating the effect of changes in the unemployment rate on the SSDI application rate.
[2] See Bound and Burkhauser (1999) and Autor and Duggan (2003).

In addition to investigating the extent to which this geographic variation in SSDI applications reflects differences in demographics, disability, and state economies, this paper also examines the correlation between state policies and application rates. States play a critical role in both the administration of the SSDI program and, indirectly, in determining its attractiveness. State governors appoint the top state-level administrators of the program, which could directly affect program administration (Iyengar and Mastrobuoni 2008). If the program administration makes acceptance more likely, decreases wait-time, or in other ways streamlines the application process, applications could increase. State policy indirectly affects the relative value of the Medicare component of receiving SSDI benefits by affecting the accessibility and affordability of other forms of health insurance through regulation of the private insurance market and the administration of the Medicaid program. States also determine the generosity and duration of unemployment insurance benefits, affecting the valuation of the financial benefit of SSDI.

Finally, this paper examines the total SSDI application rate as well as the application rate broken down into its two components: the SSDI-only applications and the concurrent applications to SSDI and the Supplemental Security Income (SSI) program. Individuals must meet work-history requirements, both recent and over their lifetimes, and fit strict disability criteria to be eligible for the SSDI program. SSI is a means-tested program for individuals who can no longer work, using the same disability criteria as the SSDI program for non-elderly applicants but augmenting the work-related benefit. By separating the two populations we test the hypothesis that the two populations respond differently to specific state policies.

The paper continues as follows. Section 1 discusses the SSDI application decision and factors that may influence state-level statistics. Section 2 discusses the model and the data used to determine the underlying causes of the state-level variation in SSDI application rates. Section 3 presents the results. Section 4 presents an alternative model to explain within-state variation in SSDI applications and the results. Section 5 concludes that demographic, health, and employment characteristics of the state explain the largest variations in SSDI application rates. State policy concerning health insurance is second. State-appointed administrators have little effect. The residual that the model cannot explain is minimal: less than 20 percent of the between-state variation and less than 8 percent of the within-state variation remain unexplained.

1. SSDI Application Decisions at the Individual Level

In theory, an individual's decision to apply for SSDI is a matter of weighing the costs and benefits of application: one applies if it increases the expected present value of lifetime utility. Individuals are eligible for SSDI if they are not currently earning more than the Substantial Gainful Activity level, are unable to do so for at least a year, and have worked long enough and recently enough to be covered by SSDI.[3] Workers who apply must weigh their current earnings and future labor market opportunities against the future stream of SSDI benefits, plus Medicare coverage after two years, times the probability of being accepted to the program, minus any costs of application.[4] The value of the decision can be expressed as $V_t = V_t(E_t)$ where E_t, employment status at time *t*, equals zero if the decision in the current period is to work, one if the individual claims SSDI, two if he decides not to work or apply. The value of working will equal this period's utility, which is derived from labor market earnings, W_t; leisure time when working, L_t^0; and the effort of work which is a function of health, *e(h),* plus the discounted value of facing employment and application decisions next period, where β is the discount factor.

$$V_t(0) = U\left(L_t^0, W_t, e(h)\right) + \beta V_{t+1}(E_{t+1}) \qquad (1)$$

If the individual applies for SSDI, he faces a probability $\pi(h)$ that his claim will be accepted, which is also a function of underlying health. The value of applying for SSDI is the weighted sum of the underlying utilities based on the outcome of the application, minus the application costs, *c*. If the claim is accepted, the individual receives current utility from leisure when not working, $L_t^1 > L_t^0$, and SSDI benefits received, plus the discounted value of continuing SSDI benefit receipt. If the claim is denied, the individual receives current utility from leisure when not working and non-wage, non-SSDI benefit income, I_t, when the individual is not in receipt of benefits, plus the discounted value of facing the employment decision next period when he must decide whether to appeal, work, or remain unemployed.

[3] The Substantial Gainful Activity (SGA) level is set at $1,000 ($1,640) a month for non-blind (blind) DI recipients in 2011. In order to be covered by SSDI, one must have worked a specified number of quarters overall and have worked a specific number of quarters in recent years. The number of quarters and the number of recent years is a function on individual age at disability onset.

[4] For simplicity, we assume in the model that DI recipients do not participate in the labor market again once being accepted onto the program.

$$V_t(1) = \pi(h)[U(L_t^1, DI_t) + \beta V_{t+1}(1)] + (1 - \pi(h))[U(L_t^1, I_t) + \beta V_{t+1}(E_{t+1})] - c \qquad (2)$$

Finally, the utility from non-work is simply the current utility from leisure while not working and non-wage, non-SSDI benefit income, I_t, when the individual is not in receipt of benefits, plus the discounted value of facing the employment decision next period when he must decide whether to apply, work, or remain unemployed.

$$V_t(2) = U(L_t^1, I_t) + \beta V_{t+1}(E_{t+1})) \qquad (3)$$

The individual's decision will be affected by health status, which influences the probability of acceptance to SSDI and the costs of working. Age is also a factor because it influences the probability of acceptance,[5] potential wages, and possibly the disutility of work. The individual's job characteristics, such as wages and health insurance, also would influence the decision to apply because it affects the value of the outside option. The type of job could influence the SSDI decision by affecting the disutility of work.

State policies may also affect the application decision in the following ways.

Health Care. States are highly involved in determining access to and the affordability of health insurance. For example, they set Medicaid income and asset limits within federal guidelines, set program rules for the State Children's Health Insurance Program (SCHIP), and apply for waiver programs for Medicare home health care. Cohen and Tumlinson (1997) and Pezzin and Kasper (2002) highlight the interactions between Medicaid policy and Medicare usage. The finding that Medicaid generosity influences Medicare use suggests that the value of Medicare coverage accompanying SSDI receipt is related to policies under state control.

In addition, states are highly involved in the regulation of the health insurance market. States may limit the ability of insurance companies to price based on individual demographic and health characteristics (community rating) and to deny coverage (guaranteed issue), and even mandate individual health insurance coverage. Studies show that these regulations have a

[5] Age is specifically in the disability insurance determination process because the assessment of the ability to be retrained changes if an applicant is between age 50-54 (Approaching Advanced Age), age 55-59 (Advanced Age); or age 60-64 (Retirement Age).

significant effect on coverage (e.g., Buchmueller and DiNardo 2002; Long and Stockley 2009), and presumably also subsequent health care access.

The effect of health care access on the SSDI application rate is theoretically ambiguous. On the one hand, individuals with access to health insurance might be more likely to apply for SSDI because they would be less likely to go uninsured during the two-year waiting period for Medicare coverage. This hypothesis is explored in Gruber and Kubik (2002), who find that individuals with access to health insurance from a spouse are 26 to 74 percent more likely to apply for SSDI benefits than those without external access to health insurance. On the other hand, individuals might be less likely to apply for SSDI benefits because Medicare coverage is relatively less attractive when health insurance is available elsewhere.

Unemployment Insurance. A second way that states can influence the SSDI application rate is through their unemployment insurance (UI) program. UI, a federal-state partnership program based on federal law, is administered at the state level. The state sets the benefit structure (eligibility and benefit levels) and tax structure (wage base and tax rates). Previous research has generally measured state UI-generosity by examining the average replacement rate (Vroman 2007), maximum benefit level (Krueger and Mueller 2008), or the existence of dependent benefits (Krueger and Mueller 2008). Rutledge (2011) examines the role of UI extensions on the propensity to apply for DI at the individual-level and the application rate at the state-level on a monthly basis.

While many have documented the relationship between SSDI applications and the unemployment rate (Rupp and Stapleton 1995; Autor and Duggan 2003; Lahiri, Song, and Wixon 2008), less work has been done on the relationship between UI generosity and the SSDI application rate. Recent work by Lindner (2011) finds that a more generous UI benefit delays SSDI application and Rutledge (2011) finds that UI benefit exhaustion affects the timing of SSDI application. Thus, we hypothesize that generous and/or long-lasting UI benefits will reduce the SSDI application rate for two reasons. First, if the UI benefit duration is short, workers may be more concerned about their ability to find a new job before their benefit runs out and thus may be easily induced to apply for SSDI. Second, UI benefit generosity may be related to job search effort and the quality of the ensuing job match. Caliendo, Tatsiramos, and Uhlendorff (2009) find that longer UI benefits improve the quality of the job found, in terms of both wages and

subsequent tenure. Thus, more generous UI benefits may lead to fewer SSDI applications due to better job security and higher wages after an initial job loss.

Politics. A third way that state policy can influence SSDI application and rejection rates is through the direct administration of the program. Governors appoint the director of the state Disability Determination Services (DDS). Governors may wish to appoint lenient directors in order to create political goodwill, to maximize federal income transfers into the state, or to minimize the state's own payments through the safety net. Iyengar and Mastrobuoni (2008) highlight this classic principal-agent problem and find that states with first-term governors allow fewer applicants onto the rolls than states with re-elected governors. They interpret this finding to mean that the SSDI rolls are manipulated for political purposes but that there is a learning-curve. Further, the political-party affiliation of the governor could indicate potential changes in welfare policy or generosity. If individuals are aware that politics may influence program leniency, or just observe an increase in the probability of acceptance to the program, politics may influence the application decision.

2. Data and Model

Data. This project uses a variety of data sources. The variable of interest is the annual SSDI application rate by state, expressed as a percentage of the state's working-age population (ages 18-64) not receiving SSDI benefits.[6] We consider what factors explain the variation in application rates to SSDI and also the two components of this overall application rate – the SSDI-only application rate and the concurrent SSDI-SSI application rate.[7] Because SSI is a means-tested disability program that uses the same definition of disability as SSDI, state-level factors may influence the different types of applications differently.

The primary data for state-level health characteristics are the Center for Disease Control's *Behavioral Risk Factor Surveillance Survey* (BRFSS). This survey has been administered since 1984 and is the largest ongoing telephone survey in the United States, interviewing 350,000 adults per year about health and health-related behaviors. BRFSS provides detailed data on self-

[6] The denominator is the number of residents aged 18-64 in a state as of July 1st from the U.S. Census Bureau. From this we subtract out the number of beneficiaries of each program, obtained from the Social Security Administration Statistical Bulletins (SSA 1994-2009) since current beneficiaries are not at risk of applying.

[7] We are grateful to Paul Davies of the Social Security Administration for providing the Title 2 (DI) only, Title 16 (SSI) only, concurrent Title 2 and Title 16 receipts by state for FY1993-FY2010. The FY1993-FY2000 receipts data came from paper records from SSA's State Agency Operations Reports (SAOR) system. The FY2001-FY2010 receipts data are from SSA's Payment Management System (PMS).

rated health; health-related behaviors such as smoking and drinking; and factors correlated with health conditions such as obesity, along with state-of-residence indicators.[8] A potential concern with all telephone surveys is the influence of declining rates of land-line coverage, so we use the weights provided when doing the state-level calculations to address possible selection effects (CDC 2008).

Three health variables from the BRFSS are included in our analysis: self-reported general health status, smoking habits, and self-reported body mass index (BMI). Health status is measured as the proportion of residents in a state who respond as being in fair or poor health in each year from 1993-2009.[9] Smoking rates are measured as the proportion of residents in a state who respond that they have smoked a total of at least 100 cigarettes ever. We also include the proportion of residents of a state who are overweight or obese, defined as having a BMI of at least 25.[10]

Other important factors to be taken into account when determining SSDI applications are the socioeconomic composition and employability of potential applicants. For example, we hypothesize that a state with a relatively older population would have a higher SSDI application rate, since the screening process for age 50-plus individuals is explicitly different, making it easier to be accepted. Thus, we include annual state-level measures, based on the Annual Social and Economic Supplement of the *Current Population Survey* (March CPS), of the proportion of a state's population in various age groups, who are male, and who are white and not Hispanic. We also include indicators for the educational attainment among the population. The proportion of married residents includes individuals 15 years and older. To determine the correlation with the poverty rate, we also include the proportion of the entire population under the federal poverty line by year and state from the U.S. Census Bureau.

Variations among states and over time in employment characteristics, such as occupation and industry composition, and the unemployment rate are expected to be associated with

[8] While the BRFSS data include other health-related variables that may be related to the SSDI application rate (such as alcohol consumption, doctor visits, exercise habits, and mental health measures), these variables were not consistently available for all states over the entire 1993-2009 period.

[9] Respondents evaluate their general health status based on a five-point scale corresponding to: excellent, very good, good, fair, or poor.

[10] BMI is calculated based on an individual's self-reported height and weight. Biases in these self-reported measurements have been well-documented. However, when we adjust the BMI measures by gender, race, education, and self-reported health, using coefficients from regressions using NHANES (Cawley and Burkhauser 2006) or our own coefficients using the *Health and Retirement Study* (HRS), we find little difference in the estimated marginal effects. Thus we present the results using the self-reported BMI measures.

differences in SSDI application rates. We hypothesize that the industrial and occupational composition of the workforce in the state may affect application rates, and include the proportion of a state's workforce employed in a service occupation, blue-collar occupation, and physically-intensive industry from the March CPS.[11] Because greater unemployment lowers the opportunity cost of applying for SSDI, we include the annual unemployment rates by state from the Bureau of Labor Statistics' *Local Area Unemployment Statistics*. We also include the labor force participation rates, by age, to pick up any discouraged worker-effect.

We hypothesize that state UI policy can influence SSDI applications. Characteristics of UI policy by state include the maximum number of weeks of benefits and the ratio of the average UI benefit to the average wage, from the U.S. Department of Labor Employment and Training Administration's *Unemployment Insurance Financial Data Handbook.*

Some hypothesize that people apply for SSDI for the Medicare benefit, which would mean that the SSDI application rate may be affected by state policies regarding access to, and the price of, alternative sources of health insurance. With regard to the private health insurance market, regulations vary with respect to the ability of an individual to obtain health insurance (guaranteed issue) and the ability of insurance companies to charge differential rates (community rating). We compiled historical state-level data on health insurance regulations.[12] Because these two regulations are highly correlated, we follow Herring and Pauly (2006) and define a state as strictly regulated if it had both guaranteed issue and some form of community rating. States with a Medicaid buy-in program provide less strict earnings qualifications for Medicaid eligibility to disabled individuals who work, so we also include an indicator variable for a state having a Medicaid buy-in program.[13]

The last state policy variable is an indicator for states that mandate employers to provide temporary disability insurance (TDI) to employees. These programs were mostly enacted after the Great Depression and provide workers with partial compensation for wages lost due to

[11] The proportion of the workforce in a physically-intensive industry includes those in the agriculture, construction, manufacturing, transportation, or utilities industries. We use the 2000 Census Occupation and Industry codes for all years.

[12] Data on state regulations of health insurance were compiled from The Henry J. Kaiser Family Foundation (2010a; 2010b), and Georgetown University Health Policy Institute (2004).

[13] These data were compiled from Kehn, Croake, and Schimmel (2010), Croake and Liu (2009), Gruman et. al (2008), Jensen (2004, 2006), Georgia Department of Community Health (https://www.gmwd.org/WebForms/StaticContent1.aspx), Delaware Health and Social Services (http://dhss.delaware.gov/dhss/dmma/), Commonwealth of Kentucky (http://manuals.chfs.ky.gov/dcbs_manuals/DFS/VOLIVA/OMVOLIVA.pdf).

temporary, non-occupational disability. Holding all else constant, we hypothesize that the five states that mandate employer DI have lower demand for SSDI (lower application rates).[14]

Finally, we add political variables from the National Governors Association's *Governors Database* and the Council of State Governments' *The Book of the States*. We include the governor's party affiliation, an indicator for reaching the term limit, and an indicator for an incumbent governor.

Estimation Model. To investigate the contribution of state characteristics to the variation in SSDI application rates, the baseline regression specification is:

$$App_{st} = \alpha + \beta_1 H_{st} + \beta_2 X_{st} + \beta_3 E_{st} + y_t + \varepsilon_{st} \quad (4)$$

where *App* is the percent of the working-age population that applies in state *s* at time *t*, *H* is a vector of variables measuring the health status of the population, *X* is a vector of demographic information, *E* is a vector of employment variables, including the occupational and industrial composition of the workforce, and the unemployment rate.[15] Because these factors may differentially affect applications to SSDI-only or concurrent SSDI-SSI applications, we estimate this equation for each of the following: total applications to SSDI, applications to SSDI only, and concurrent SSDI-SSI applications. Finally, while we expect these factors to explain a substantial amount of the variation in the state application rates, general economic time trends could still influence the application rates. Thus, we include a year fixed-effect to control for national changes over time that would be expected to equally affect each state's application rate (y_t). The standard errors are clustered at the state level.

To this baseline model, we then add information about state policies that may influence SSDI applications. The second specification is as follows:

$$App_{st} = \alpha + \beta_1 H_{st} + \beta_2 X_{st} + \beta_3 E_{st} + \beta_4 I_{st} + y_t + \varepsilon_{st} \quad (5)$$

[14] Five states enacted employer disability insurance mandates prior to the first year of data included in this analysis: California (1946), Hawaii (1969), New Jersey (1948), New York(1949), Rhode Island(1942) (U.S. Social Security Administration 2010).

[15] Because disability precedes disability application, we also used lagged health measures to predict application rate. Because aggregate health measures are strongly correlated over time, the estimates of the effect were virtually identical, and we present the results with contemporaneous health to avoid losing a year of observations.

where I_{st} is a vector measuring insurance coverage at the state level: unemployment insurance generosity; health insurance access; and TDI mandates. The remaining variables are defined as above.

The final group of explanatory variables measure characteristics of the politics of the governor of the state:

$$App_{st} = \alpha + \beta_1 H_{st} + \beta_2 X_{st} + \beta_3 E_{st} + \beta_4 I_{st} + \beta_5 P_{st} + y_t + \varepsilon_{st} \qquad (6)$$

where *P* contains information about the political party and the term of the governor in state *s* in year *t*.

Interpretation of State-Level Regressions. This project uses state-level data, which raises concern over aggregation bias and ecological inference. If the grouping mechanism is not random (conditional on the covariates), or the individual-level model is not properly specified, then interpreting the findings as individual behavior is problematic, sometimes referred to as the ecological fallacy.[16] Intuitively, this means that if individuals pick the state in which they live based on the SSDI or SSI application rate, and our variables do not adequately control for this selection, then the state-level correlations cannot be interpreted as a sign of what the underlying individuals do. Grunfeld and Griliches (1960) argue individual-level regressions are likely misspecified and that aggregation may in fact decrease the specification error, providing an aggregation gain. For example, individuals may choose their neighborhoods for a variety of reasons that are unmeasured by the econometrician, and aggregating the data to the MSA-level, and thus subsuming neighborhood selection, may reduce the bias of the estimates. If the dependent variable is not likely to be involved in the residential choice function — i.e. individuals do not select their state of residence based on the state's SSDI application rate — then aggregating is less likely to produce aggregation bias.

At the least, our estimates measure the correlation between states with certain characteristics and their SSDI application rate. If our individual-model is correctly specified and grouping the data at the state-level is essentially random, the estimates can be interpreted as

[16] For more reading on this issue, see Robinson (1950), Hanushek et a. (1974), Grunfield and Griliches (1960), Stoker (1993), Firebaugh (2001), Freedman (2001), Jargowsky (2005), for a review.

measuring the underlying individual-level relationships between the covariates and the application decision.[17] Because of the model uncertainty, we do the later with caution.

3. Results

Descriptive Results. Table 1 presents the descriptive statistics of the data. We have 862 state-level observations, which represent data from 1993-2009 for 50 states plus Washington D.C., with a few exceptions due to data limitations.[18] On average, 0.83 percent of the working-age population applies for SSDI per year, with an almost equal split between SSDI-only and SSI-SSDI concurrent applications. However, the rate varies widely among states, from 0.6 percent (Oregon) to 1.65 percent (Mississippi) for overall SSDI applications, from 0.04 (Oregon) to 1.0 percent (Michigan) for SSDI-only applications, and from 0.03 (Oregon) to 0.9 percent (Mississippi) for SSDI-SSI concurrent applications.

Measures of health, demographics, and employment also vary considerably. For example, self-rated bad health is 15 percent of the population, on average, but varies between 8 and 25 percent. The college-age population (ages 18-25) varies between 7 and 17 percent. And between 8 percent (Washington, D.C.) and 38 percent (Mississippi) of the state is employed in blue-collar occupations. State policies potentially influencing the SSDI application decision also vary by state. While UI benefit duration is relatively uniform during this period, with a standard deviation of nine weeks, the average UI benefit as a percent of average wages varies from 20 (California) to 55 percent (Hawaii). In terms of health policy, 20 percent of state-years were under a strict health insurance regulating regime. Interestingly, states moved both into and out of this category during our period, so identification comes from both the introduction and the removal of regulation. Five states in all years had mandated that employers provide private disability insurance to all employees. Slightly more than half of the governors were Republican during this period, and more than one quarter were at their term limit.[19]

Figure 1 presents a state map of the average SSDI application rates between 1993 and 2009 and highlights the state variation in application rates. The average application rate varies

[17] Our estimated coefficients are the sum of individual effects and any group-level or peer effects present.
[18] Data are missing for: Wyoming in 1993, Rhode Island in 1994, Washington, DC in 1995, and Hawaii in 2004 because of lack of coverage in BRFSS; and Nevada in 1994 due to lack of detailed data from Social Security on SSDI-only applications; we have 683 observations for SSDI-SSI concurrent applications.
[19] For Washington, DC, the characteristics of the mayor are included in the political variables instead of governor.

between 0.49 percent (Utah) and 1.4 percent (Mississippi). A strong regional component is evident, with the South having much higher application rates and the west tending to have lower overall application rates.

Figures 2 and 3 present time trends in SSDI application rates for specific states and the all-state average. Mississippi has the highest application rate on average and the highest in virtually every year (exceeded only by West Virginia in 1998 and 2004). Utah has the lowest application rate on average and the lowest in 11 of the 17 years. Ohio has the highest growth rate between 1993 and 2009, while New York exhibits the lowest growth (one of seven states with a negative growth rate). Figure 3 presents the time trends for four states that introduced and/or eliminated strict non-group health insurance regulation during the sample period.[20] The dashed line indicates when strict non-group health insurance regulation is in place. While the regulation changes do not exhibit a sharp discontinuity in the application rates, this figure does highlight a dip in applications that occurs while the regulations are in place.

Regression Results. The Ordinary Least Squares (OLS) regression results of total SSDI application rates by state are shown in Table 2.[21] The first column presents the results from Equation (4), the second column adds the state policy variables outlined in Equation (5), and the third column adds the political variables in Equation (6). All three equations have the same sample size (862) and have included year fixed-effects (not reported in table). Not surprisingly, Column (1) indicates that the health, demographics, and employment situation of the state greatly affect the SSDI application rate. Most of the coefficients are as expected, albeit often insignificant. Poor health and high poverty rates are positively correlated with SSDI applications, as is a higher proportion of Caucasians and a higher proportion of women. Education, age, and occupation are all insignificant. Surprisingly, the state-level unemployment rate is not significant in this specification, but the labor force participation rate is important.[22]

Column (2) adds the state policy on unemployment and health insurance to the regression. The coefficients on the health, demographic, and employment variables remain

[20] Maine eliminated their strict non-group regulations in 2009, thus not very illustrative for this figure.
[21] We contemplated using logged-application rates as the dependent variable, as is done in much of the literature. However, the distribution of the application rates was much closer to normal than the distribution of the log-transformation of the application rates.
[22] This is not explained by colinearity. If we estimate the relationship without the unemployment rate, the labor force participation rate remains significant; if we estimate without the labor force participation rate, the unemployment rate remains insignificant.

virtually unchanged, both in magnitude and significance. The biggest change is that race is no longer significant. The five states with mandated employer disability insurance have lower SSDI application rates, but no other policy is significant. Column (3) adds political variables, as suggested by Iyengar and Mastrobuoni (2008). While the coefficients on the other variables remain stable, regaining significance on race, having a Republican governor is negatively correlated with state-level SSDI application rates.

While it is interesting to see what is correlated with the SSDI application rates, it is important to put the marginal effects into context. Using specification (3) from Table 2, we explore how much of the state-variation in SSDI application rates can be explained by the underlying health, demographic, and employment situation within a state. We predict that the average state-level application rate would be 0.997 percent in 1993-2009, with a between-state variation of 0.21. If we set all health, demographic, and employment information to be the best observed in the data (maximum value for characteristics with a positive coefficient and minimum value for characteristics with a negative coefficient), we would then predict an application rate of only 0.53 and a between-state variation that drops to 0.04. Changing the population characteristics leads to an almost 50-percent drop in the application rate. If we give every state the worst health and demographic characteristics, then the predicted application rate increases to 1.50 percent.

Tables 3 and 4 present the analogous regressions for the two components of the total SSDI application rate: SSDI-only applications and SSDI-SSI concurrent applications, respectively. This analysis allows us to determine if different segments of the SSDI application population are affected by different factors. For example, SSI is a needs-tested disability program, so we would expect differences in state poverty rates to be more correlated with concurrent SSDI-SSI than with SSDI-only applications. Indeed, we find significant differences. Not surprisingly, the poverty-rate effect found in the overall SSDI application rate is driven by the SSDI-SSI concurrent application rate (Table 4, Columns 1-3). The effects of having a higher proportion of Caucasians in the population found in the overall SSDI application rate is driven by the SSDI-only applications, while the correlation between self-reported bad health and SSDI applications is driven by the SSDI-SSI concurrent applications.

Interestingly, the negative relationship between labor force participation and SSDI applications is driven by the SSDI-only applicants. The SSDI-SSI concurrent applications drive

the relationship between the political variables found in the overall application rate. If the relationship between the governor's politics and the application rate is driven by a principal-agent problem (Inyengar and Mastrobuoni 2008), one would not expect the low-income disabled to be the most responsive.

Once the SSDI application rate is broken into its components, we find two new results. First, smoking history is positively correlated with SSDI-only applications (Table 3, Columns 1-3). Second, the length of UI benefits are negatively correlated with the SSDI-only application rate. This finding suggests that given a state-level unemployment rate and labor force participation rate, extending UI benefits can save the SSDI program time in terms of processing applications and potentially money if these applicants eventually are allowed onto the program. This is consistent with Rutledge (2011).

Another interesting finding is that states with mandated employer-provided disability insurance have fewer overall SSDI applications, driven by the SSDI-SSI concurrent applications. As many recent reform proposals argue, private DI companies providing short-term insurance may implicitly act as a pre-screening mechanism and assist in getting individuals back to work before entering the permanent disability program. They may be more effective at getting their marginal claimants back to work, thus lowering total SSDI applications. If the marginal claimants are more likely to be among the SSDI-SSI applicant pool, this could be the most affected population.

4. Within-state variation

One may be concerned that state-level characteristics remain unaccounted for even in our full model (Equation 6), potentially leading to omitted variable bias or aggregation bias in the estimates presented thus far. If these omitted variables are fixed over time within a state, we can address this concern by adding a state fixed-effect in our specification:

$$App_{st} = \alpha_t + \beta_1 H_{st} + \beta_2 X_{st} + \beta_3 E_{st} + \beta_4 I_{st} + P_{st} + u_s + \varepsilon_{st} \qquad (7)$$

This specification, however, answers a slightly different question, which is how much *within-state* variation in SSDI applications rates can we explain, not how much cross-state variation can we explain. The identification comes from within-state, over-time variation in application rates

by looking at within-state, over-time variation in demographics, economics, state policy, and politics. The downside to this methodology is that we lose a lot of variation in our control variables, as is highlighted in Table 1, Column (5). The within-state standard deviation is generally less than half the overall variation. The health and demographic variation decreases most when using only within-state changes, while these were the variables that had the largest correlation with the state-level application rates. However, political variables continue to provide variation. Some variables do not vary at all, such as mandated employer disability insurance, so we cannot estimate the influence of that policy on SSDI application rates using a state fixed-effects model.

Table 5 presents the OLS regression results with state-fixed effects. Column (1) is the total SSDI application rate, Column (2) is the SSDI-only applications, Column (3) the SSDI-SSI concurrent, applications. While much variation is lost, especially among the health and demographic variables, by relying on within-state changes for identification, the state fixed-effects are significant, and the Hausman test suggests that a fixed-effects model is more appropriate than a random-effects model.

Within-state changes in the labor force participation rate remain significantly and negatively related to the total SSDI application rate, driven by the SSDI-only applicants. Now we find that within-state changes in the unemployment rate are positively correlated with increases in the total SSDI-application rate, driven by the SSDI-SSI concurrent application rate. We also find that changing the educational composition of the state population is related to the SSDI-SSI application rate. An increasing proportion of less-than-high-school educated individuals is associated with declines in the application rate, probably due to an inadequate work history to qualify for SSDI. Increasing prevalence of post-graduate educated individuals is also associated with declines in the SSDI-SSI application rate, likely reflecting the type of job and risks these individuals face as well as their likelihood of not qualifying for a means-tested program.

Finally, we find that strict state regulation in the non-group health insurance market is negatively correlated with SSDI applications, both SSDI-only and SSDI-SSI concurrent. This is the first evidence of which we are aware that non-group health insurance market regulation can influence the decision to apply to SSDI. Finally, we find that having a Republican governor is

also negatively correlated with a state's SSDI application rate, driven by the SSDI-SSI concurrent applications.

5. Conclusions

This paper examines why SSDI application rates vary so much between states. We find, not surprisingly, that health, demographics, and employment are the major determinants of this state-variation. With these simple covariates, we can explain over 70 percent of the variation in total SSDI application rates. We also find that having state-mandated private TDI insurance is associated with lower application rates, and the having a Republican governor is correlated with lower application rates. However, adding these variables to the model only explains an additional 4 percent of the between-state variation.

It is interesting to note the relationship between the macroeconomy and SSDI; labor force participation rates are more correlated to the SSDI application rate than the unemployment rate. SSDI-only applications are additionally affected by the UI benefit duration. SSDI-SSI concurrent applications seem to be independent of the labor force participation rate, unemployment rate, and unemployment benefit parameters.

Two of the most interesting findings in this paper are the role of state-mandated disability insurance (TDI) and the strict health insurance market regulations. Mandated private TDI insurance is negatively correlated with the overall SSDI application rate driven by the SSDI-SSI applicant pool. This is important given the emphasis on privately provided, short-term disability insurance programs in many SSDI reform proposals (Autor and Duggan 2010, for example) as a way to provide services to workers with disabilities quickly before they apply for permanent disability benefits. Further, while it does not explain the between-state variation, we find that strict health insurance market regulation is correlated with lower SSDI applications within a state. This is the first evidence of which we are aware that health insurance regulation influences SSDI applications, and motivates further work.

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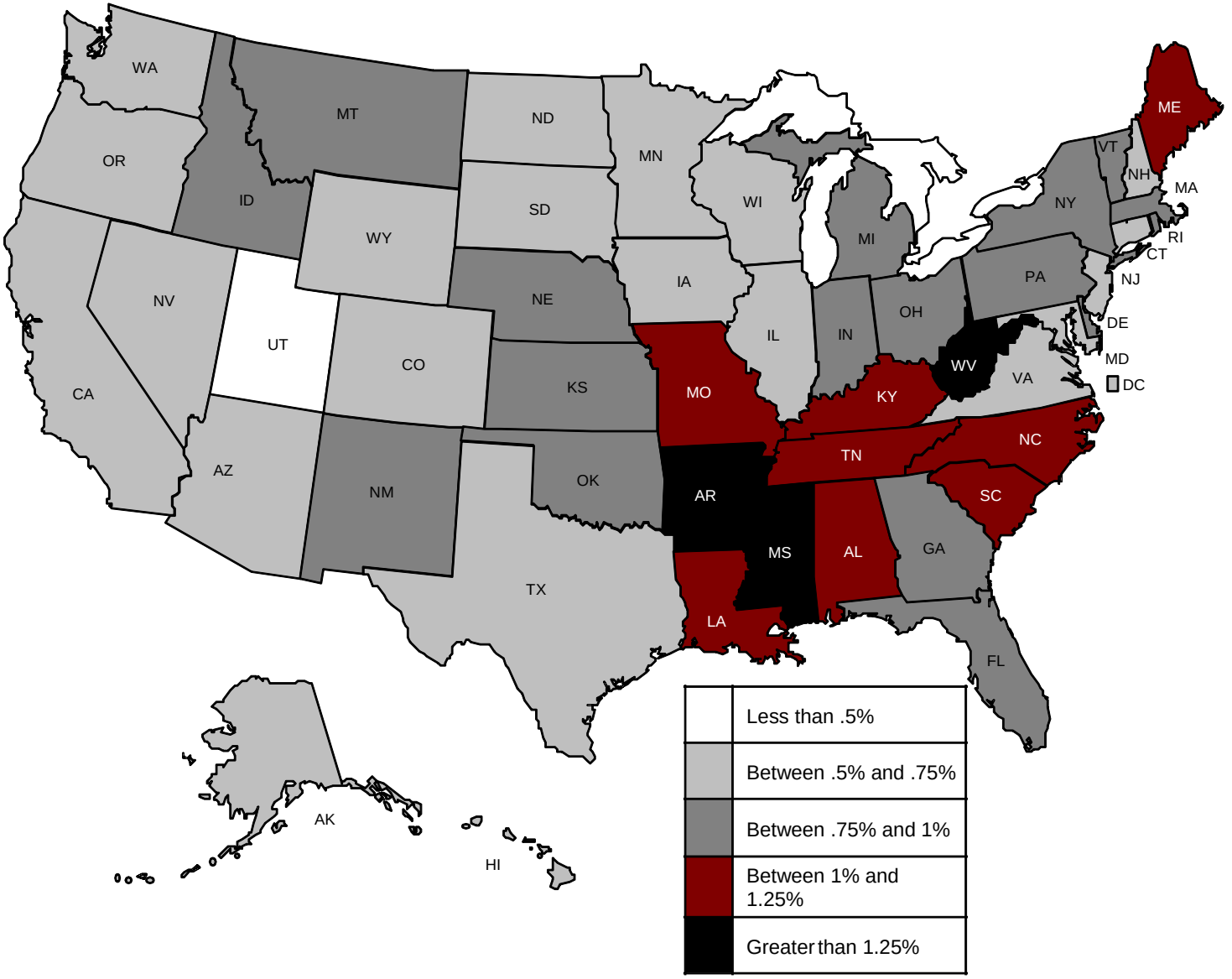
Figure 1: Average Total SSDI Application Rate, by State, 1993-2009



Utah had the lowest rate at .49 percent, while Mississippi had the highest at 1.41 percent.

Figure 2: Time Trends Total SSDI Applications of Selected States, 1993-2009

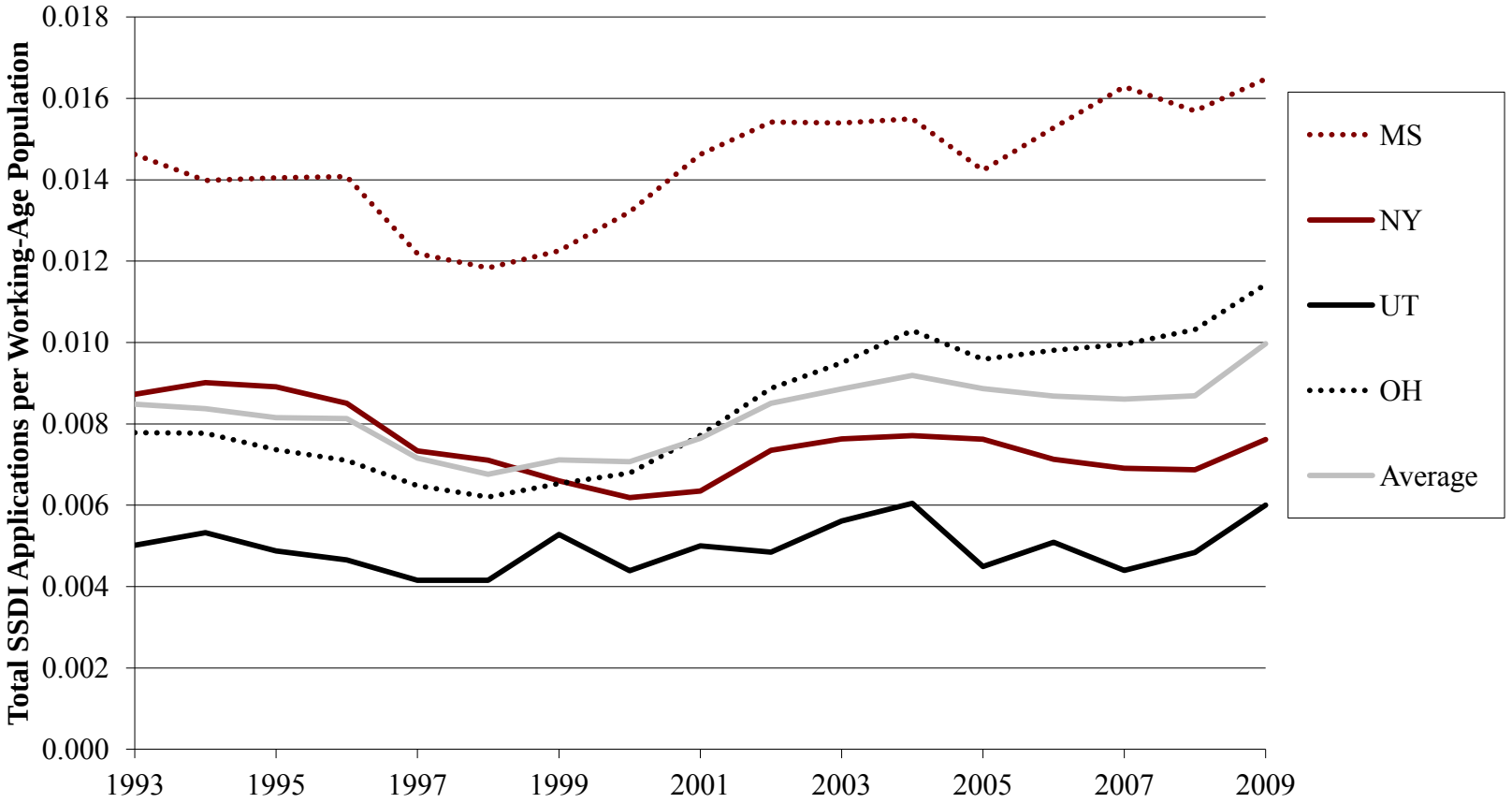


Figure 3: Strict Health Insurance Regulation States, 1993-2009

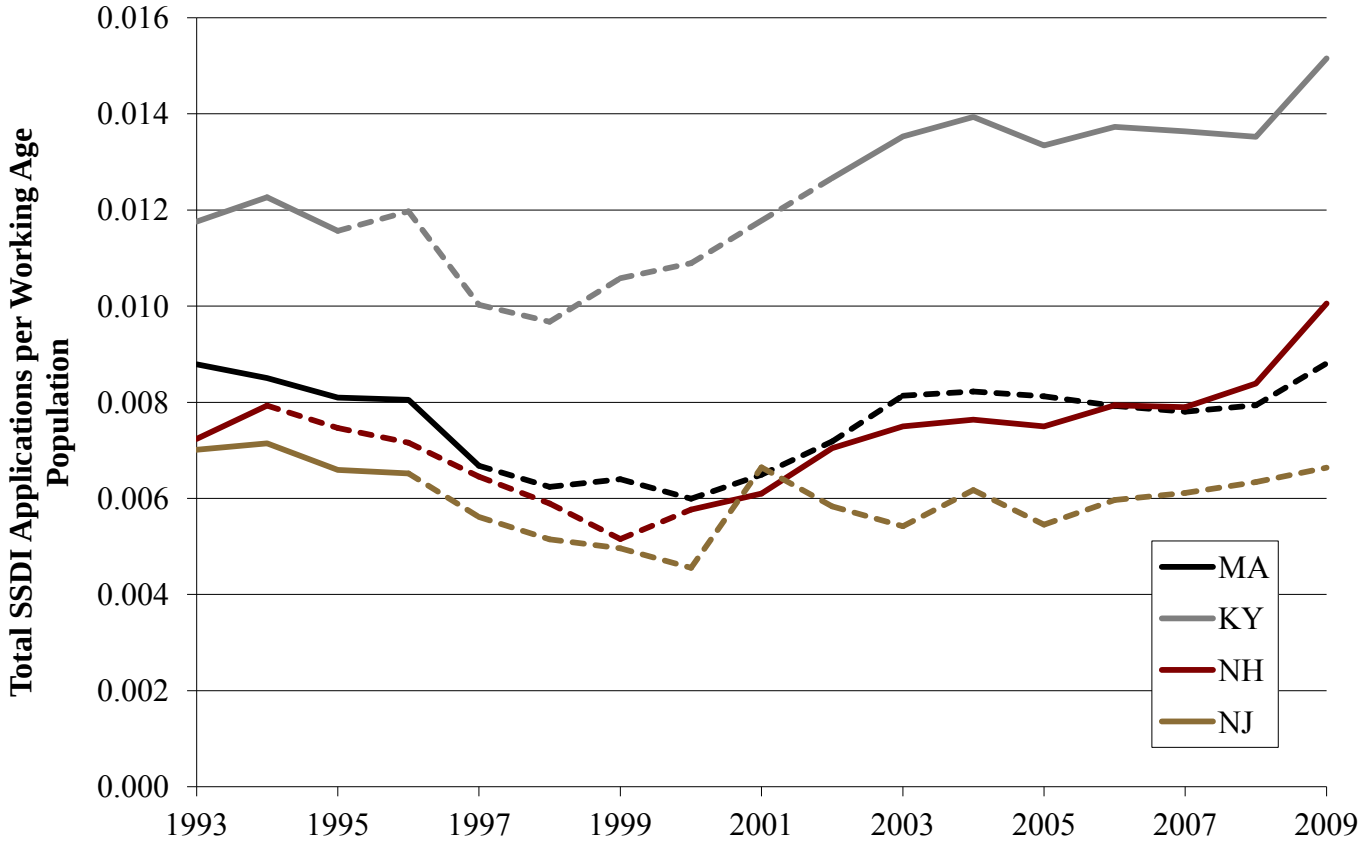


Table 1. Descriptive Statistics

		Between States Over Time			Within-State Over Time
	Mean	Standard Deviation	Minimum	Maximum	Standard Deviation
Dependent Variables (Percent of Working-Age Population)					
All SSDI application	0.83	0.24	0.06	1.65	0.11
SSDI only application	0.43	0.11	0.04	1.02	0.05
Concurrent SSDI-SSI application	0.40	0.15	0.03	0.92	0.07
Health, Demographics, Employment (Proportions)					
Health					
Fair/Poor Health	0.15	0.03	0.08	0.25	0.01
Ever Smoke 100+ Cigarettes	0.47	0.05	0.25	0.61	0.02
Overweight or obese (BMI)	0.59	0.06	0.42	0.71	0.05
Age Profile					
Population under 18	0.26	0.03	0.19	0.37	0.02
Population 18-25	0.11	0.01	0.07	0.16	0.01
Population 25-50 (*omitted category)*	0.35	0.02	0.29	0.44	0.02
Population 50+	0.28	0.04	0.14	0.38	0.03
Education Profile					
Less than high school	0.15	0.05	0.05	0.33	0.03
High school degree (*omitted)*	0.34	0.05	0.20	0.48	0.02
Some college	0.42	0.06	0.23	0.57	0.03
Post-graduate	0.09	0.03	0.03	0.28	0.01
Demographics					
Male	0.49	0.01	0.46	0.52	0.01
Married	0.55	0.05	0.27	0.65	0.02
White, non-Hispanic	0.76	0.16	0.16	0.99	0.03
Poor	0.12	0.04	0.05	0.26	0.02
Employment Profile					
Service occupation	0.43	0.03	0.33	0.53	0.02
Blue-collar occupation	0.25	0.04	0.08	0.38	0.02
Other occupations *(omitted category)*	0.32	0.05	0.21	0.58	0.03
Agriculture and physical industries	0.29	0.05	0.11	0.42	0.02
Professional industries *(omitted)*	0.71	0.05	0.58	0.89	0.02
Labor force participation	0.67	0.04	0.55	0.76	0.01
Unemployment rate	0.05	0.02	0.02	0.13	0.01
State Policy					
Length of UI benefits (weeks)	31.66	9.27	26.00	66.33	9.20
UI benefits/average wage	0.37	0.06	0.20	0.55	0.02
Strict regulation of HI market	0.13	0.33	0.00	1.00	0.13
State-mandated employer DI (TDI)	0.10	0.30	0.00	1.00	0.00
Medicaid buy-in	0.37	0.48	0.00	1.00	0.43
Politics (Proportion)					
Republican governor	0.54	0.50	0.00	1.00	0.41
Governor at term limit	0.29	0.45	0.00	1.00	0.40
Incumbent governor	0.39	0.49	0.00	1.00	0.47

Source: Authors' calculations.

Table 2. Regression Results for All SSDI Applications, 1993-2009

	(1)	(2)	(3)
Health and Demographics			
Proportion poor health	2.249***	2.172***	2.087***
	(0.570)	(0.580)	(0.580)
Smoke	0.336	0.312	0.267
	(0.250)	(0.220)	(0.210)
Percent overweight or obese (BMI)	0.296	0.035	0.034
	(0.390)	(0.380)	(0.370)
Population under 18	-0.41	-0.53	-0.25
	(0.490)	(0.500)	(0.480)
Population age 18-25	-0.69	-0.63	-0.65
	(0.510)	(0.520)	(0.510)
Population 50+	0.141	0.109	0.234
	(0.420)	(0.420)	(0.430)
Less than High School	-0.513	-0.251	-0.153
	(0.460)	(0.440)	(0.400)
Some college	-0.365	-0.354	-0.313
	(0.380)	(0.370)	(0.370)
Post-graduate	-0.494	-0.704	-0.664
	(0.540)	(0.550)	(0.550)
Male	-1.867**	-1.793**	-1.785**
	(0.810)	(0.730)	(0.730)
Married	-0.354	-0.375	-0.445
	(0.350)	(0.330)	(0.330)
White, non-Hispanic	0.233***	0.163	0.200*
	(0.080)	(0.110)	(0.110)
Poor	1.215***	0.750**	0.799**
	(0.380)	(0.320)	(0.320)
Service occupation	-0.602	-0.507	-0.422
	(0.380)	(0.380)	(0.380)
Blue-collar occupation	0.857	0.482	0.467
	(0.540)	(0.520)	(0.510)
Agriculture	0.156	0.368	0.448
	(0.400)	(0.400)	(0.400)
Labor force participation	-1.201***	-1.422***	-1.393***
	(0.440)	(0.490)	(0.470)
Unemployment rate	0.448	1.154	1.087
	(0.880)	(0.870)	(0.860)
State Policy			
Length of UI benefits		-0.003	-0.003
		(0.000)	(0.000)
UI benefits/average wage		0.070	0.081
		(0.210)	(0.210)
Strict regulation		-0.006	-0.003
		(0.030)	(0.030)
State-mandated employer disability insurance		-0.126***	-0.117***
		(0.030)	(0.030)
Medicaid Buy-In		0.011	0.008
		(0.020)	(0.020)
Politics			

Republican governor			-0.026*
			(0.01)
Governor at term limit			0.029
			(0.02)
Incumbent governor			-0.02
			(0.01)
Constant	2.179***	2.628***	2.454***
	(0.64)	(0.68)	(0.65)
Observations	862	862	862
R-squared	0.774	0.791	0.796

Source: Authors' calculations.

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors clustered by state are in parentheses. Also included is a set of year dummies (excluding 1993).

Table 3. Regression Results for SSDI-Only Applications, 1993-2009

	(1)	(2)	(3)
Health and Demographics			
Proportion poor health	0.336	0.324	0.300
	(0.250)	(0.260)	(0.260)
Smoke	0.229**	0.274***	0.258**
	(0.100)	(0.100)	(0.100)
Percent overweight or obese (BMI)	0.026	0.071	0.067
	(0.200)	(0.210)	(0.210)
Population under 18	-0.29	-0.37	-0.30
	(0.260)	(0.250)	(0.240)
Population age 18-25	-0.34	-0.42	-0.42
	(0.250)	(0.260)	(0.250)
Population 50+	0.102	-0.059	-0.030
	(0.250)	(0.230)	(0.240)
Less than High School	0.041	0.015	0.041
	(0.220)	(0.180)	(0.180)
Some college	-0.095	-0.066	-0.059
	(0.170)	(0.160)	(0.160)
Post-graduate	-0.006	0.052	0.058
	(0.290)	(0.290)	(0.290)
Male	-0.421	-0.473	-0.459
	(0.390)	(0.370)	(0.370)
Married	-0.128	-0.159	-0.170
	(0.120)	(0.110)	(0.110)
White, non-Hispanic	0.197***	0.221***	0.230***
	(0.050)	(0.040)	(0.040)
Poor	-0.150	-0.098	-0.084
	(0.180)	(0.170)	(0.180)
Service occupation	0.027	-0.013	0.005
	(0.190)	(0.180)	(0.180)
Blue-collar occupation	0.144	0.180	0.172
	(0.250)	(0.240)	(0.240)
Agriculture	0.473**	0.432**	0.450**
	(0.220)	(0.210)	(0.210)
Labor force participation	-1.406***	-1.470***	-1.470***
	(0.240)	(0.240)	(0.250)
Unemployment rate	0.064	0.113	0.104
	(0.360)	(0.370)	(0.360)
State Policy			
Length of UI benefits		-0.003**	-0.003**
		(0.000)	(0.000)
UI benefits/average wage		0.047	0.048
		(0.090)	(0.090)
Strict Regulation		-0.014	-0.014
		(0.010)	(0.010)
State-mandated employer disability insurance		0.021	0.023
		(0.020)	(0.020)
Medicaid Buy-In		0.006	0.005
		(0.010)	(0.010)
Politics			

Republican governor			-0.008
			(0.01)
Governor at term limit			0.004
			(0.01)
Incumbent governor			-0.001
			(0.01)
Constant	1.250***	1.425***	1.388***
	(0.36)	(0.33)	(0.34)
Observations	862	862	862
R-squared	0.731	0.737	0.738

Source: Authors' calculations.

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors clustered by state are in parentheses. Also included is a set of year dummies (excluding 1993).

Table 4. Regression Results for Concurrent SSDI and SSI Applications, 1993-2009

	(1)	(2)	(3)
Health and Demographics			
Proportion poor health	1.891***	1.825***	1.763***
	(0.460)	(0.450)	(0.450)
Smoke	0.108	0.040	0.011
	(0.200)	(0.170)	(0.170)
Percent overweight or obese (BMI)	0.265	(0.041)	(0.038)
	(0.300)	(0.280)	(0.270)
Population under 18	-0.15	-0.18	0.03
	(0.360)	(0.340)	(0.340)
Population age 18-25	-0.36	-0.23	-0.24
	(0.360)	(0.350)	(0.340)
Population 50+	0.025	0.157	0.255
	(0.340)	(0.270)	(0.280)
Less than High School	-0.555	-0.267	-0.196
	(0.430)	(0.310)	(0.280)
Some college	-0.263	-0.281	-0.247
	(0.260)	(0.240)	(0.240)
Post-graduate	-0.469	-0.739**	-0.706**
	(0.370)	(0.360)	(0.350)
Male	-1.399**	-1.282**	-1.290**
	(0.640)	(0.520)	(0.510)
Married	-0.211	-0.201	-0.260
	(0.300)	(0.270)	(0.270)
White, non-Hispanic	0.033	(0.060)	(0.032)
	(0.060)	(0.080)	(0.080)
Poor	1.350***	0.833***	0.869***
	(0.290)	(0.220)	(0.220)
Service occupation	-0.593**	-0.465*	-0.400
	(0.290)	(0.240)	(0.240)
Blue-collar occupation	0.728*	0.315	0.308
	(0.370)	(0.370)	(0.350)
Agriculture	(0.332)	(0.079)	(0.016)
	(0.260)	(0.270)	(0.260)
Labor force participation	0.240	0.083	0.111
	(0.390)	(0.390)	(0.380)
Unemployment rate	0.380	1.036*	0.977
	(0.640)	(0.610)	(0.610)
State Policy			
Length of UI benefits		-0.001	-0.001
		(0.000)	(0.000)
UI benefits/average wage		0.022	0.033
		(0.160)	(0.150)
Strict regulation		0.008	0.011
		(0.020)	(0.020)
State-mandated employer disability insurance		-0.147***	-0.140***
		(0.020)	(0.020)
Medicaid Buy-In		0.005	0.003
		(0.010)	(0.020)
Politics			

Republican governor			-0.018*
			(0.01)
Governor at term limit			0.025
			(0.02)
Incumbent governor			-0.019*
			(0.01)
Constant	0.871*	1.149**	1.014**
	(0.46)	(0.45)	(0.42)
Observations	863	863	863
R-squared	0.701	0.756	0.762

Source: Authors' calculations.
Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors clustered by state are in parentheses. Also included is a set of year dummies (excluding 1993).

Table 5. Regression Results with State Fixed Effects, 1993-2009

	(1) All SSDI	(2) SSDI-Only	(3) SSDI-SSI
Health and Demographics			
Proportion poor health	-0.069	-0.073	0.007
	(0.310)	(0.230)	(0.190)
Smoke	0.066	0.068	-0.001
	(0.270)	(0.140)	(0.170)
Percent overweight or obese (BMI)	0.027	0.131	-0.102
	(0.250)	(0.170)	(0.140)
Population under 18	0.19	0.03	0.15
	(0.430)	(0.230)	(0.250)
Population age 18-25	-0.09	-0.19	0.10
	(0.400)	(0.260)	(0.250)
Population 50+	0.314	0.189	0.116
	(0.350)	(0.190)	(0.210)
Less than High School	-0.525**	-0.187	-0.341*
	(0.260)	(0.140)	(0.170)
Some college	0.062	0.056	0.002
	(0.180)	(0.110)	(0.110)
Post-graduate	-0.775*	-0.307	-0.468*
	(0.460)	(0.260)	(0.260)
Male	0.651	0.364	0.267
	(0.400)	(0.290)	(0.230)
Married	-0.199	-0.213*	0.019
	(0.190)	(0.120)	(0.130)
White, non-Hispanic	0.248	0.249**	-0.003
	(0.210)	(0.120)	(0.160)
Poor	-0.085	-0.147	0.048
	(0.210)	(0.120)	(0.130)
Service occupation	0.155	0.079	0.073
	(0.230)	(0.150)	(0.120)
Blue-collar occupation	-0.238	-0.147	-0.089
	(0.290)	(0.210)	(0.180)
Agriculture	0.021	0.094	-0.078
	(0.270)	(0.180)	(0.150)
Labor force participation	-1.544***	-1.184***	-0.343
	(0.460)	(0.300)	(0.340)
Unemployment rate	2.034***	0.412	1.608***
	(0.730)	(0.430)	(0.480)
State Policy			
Length of UI benefits	-0.002	0.000	-0.001
	(0.000)	(0.000)	(0.000)
UI benefits/average wage	0.084	-0.042	0.130
	(0.230)	(0.140)	(0.140)
Strict regulation	-0.054***	-0.019*	-0.036***
	(0.020)	(0.010)	(0.010)
Medicaid Buy-In	0.024	0.006	0.017
	(0.020)	(0.010)	(0.010)
Politics			
Republican governor	-0.021**	-0.003	-0.018**

	(0.010)	(0.010)	(0.010)
Governor at term limit	-0.006	-0.001	-0.005
	(0.010)	(0.010)	(0.010)
Incumbent governor	0.005	-0.002	0.007
	(0.010)	(0.010)	(0.010)
Constant	1.386**	0.879***	0.505
	(0.53)	(0.28)	(0.36)
Observations	862	862	863
R-squared	0.923	0.853	0.932

Source: Authors' calculations.

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors clustered by state are in parentheses. Also included is a set of year dummies (excluding 1993) and state dummy variables.

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