ALL OR NOTHING: HEALTH AND THE U.S. SOCIAL SECURITY DISABILITY INSURANCE PROGRAM

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Abstract

Social Security Disability Insurance (SSDI) policy evaluates applicants' health as a binary outcome and creates incentives to exaggerate or even exacerbate one's health problems to acquire eligibility. This paper is the first to develop and estimate an individual decision-making model that permits the evaluation of the health effects of changes to SSDI design. Specifically, I focus on a modification that allows partial benefits for the partially disabled. Simulations show this reform can decrease the mortality rate. This decrease varies with age and reaches a maximum of 0.1 p.p for 60-year-olds. Back-of-the-envelope calculations show that thanks to the reform, ∼30,000 Americans will extend their lives by 5 years, ∼20,000 Americans — by 15 years, and ∼10,000 Americans — by 20 years. This increase in longevity will come with an increase in the total sum of the benefits and with an increase in labor supply and income taxes. After accounting for increased taxes, the investment required to prolong the life of one person by one year is around $17,000.

Keywords: Disability, Social Security, Mortality, Health, Retirement, Medicare

JEL Classification: H55, I18, J14, J22, J26

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1 Introduction

The Social Security Disability Insurance (SSDI) program is the principal public disability insurance program for disabled individuals in the United States. According to the United States Social Security Administration (SSA), in December 2019, 10 million individuals received Social Security Disability Insurance benefits that totaled $11.7 billion. The primary purpose of this program is to insure against severe medical conditions that prevent recipients from doing any substantial gainful activity for a long-lasting period. The impact of this program on labor force participation is well-established. However, the evidence of the effects of Social Security Disability Insurance on health is relatively scarce and inconclusive.

This paper explores how actual and counterfactual Social Security Disability Insurance programs shape the health outcomes of participants. All the existing research devoted to the analysis of the effects of Social Security Disability Insurance on health is based on reduced-form models that do not permit the analysis of alternative insurance designs. This study is the first one to analyze these effects using a structural model that permits the predictions of outcomes under counterfactual insurance designs. In this article, I analyze the outcomes of allowing partial disability insurance (DI) payments for partial disabilities, and, in particular, I concentrate on health outcomes under this counterfactual scenario. In the case of partial disability insurance, not only fully disabled individuals but also those who are partially disabled will be expected to receive benefits. This modification of the Social Security Disability Insurance program might serve as a valuable early intervention mechanism that can improve the health dynamics of recipients.

The last significant modification of the Social Security Disability Insurance design by the US government is the Ticket to Work program of 1999. This program allowed disability insurance recipients to keep some part of their benefits for a couple of years in case these recipients returned to work. Recently, multiple economists have called for a reform of the SSDI program (see Autor and Duggan, 2006; Yin, 2015; Maestas, 2019, etc.). One of the most frequently suggested reforms is the introduction of partial disability insurance benefits.

Even though health is multifaceted, the existing Social Security Disability Insurance policy treats health as a binary outcome. The current Social Security Disability Insurance program is an all-or-nothing system. A person can either have a condition that will make them eligible for Social Security Disability Insurance benefits or not. In the absence of a partial disability insurance option, partially disabled individuals who are still able to work have significant incentives to exaggerate or even exacerbate their health problems. Many partially disabled individuals succeed in obtaining Social Security Disability Insurance benefits. According to Benitez-Silva et al. (2004), 20% of Social Security Disability Insurance beneficiaries have some capacity to return to work. If partial Social Security Disability Insurance benefits were available, partially disabled individuals could receive substantial incentives to stay in the labor force and improve their health dynamics.

The current SSDI policy does not cover all existing demand for disability insurance. Around 13% of 35–64-year-old Americans have some disability,[1] while only approximately 6% of 35–64 year-olds receive SSDI benefits.[2] The present-day SSDI program does not answer the needs of disabled Americans. Those with a disability earn significantly less than those without disabilities.[3] Simultaneously, people with disabilities have to bear much higher out-of-pocket costs (Kennedy et al., 2017). The introduction of partial DI designed specifically for the partially disabled can provide much-needed relief to this population.

Although the contemporary SSDI program does not address the needs of disabled Americans, its size far surpasses spending on unemployment insurance and food stamps.[4] Given this, some economists called for tightening eligibility or reducing benefits (see Golosov and Tsyvinski, 2006, and Haller et al., 2020). On the other hand, the Organization of Economic Cooperation and Development notes the US spends considerably less on disability benefits relative to other developed countries, and, hence, calls for SSDI expansion.[5]

[1] The Census Bureau's 2021 American Community Survey
[2] Annual Statistical Report on the Social Security Disability Insurance Program, 2019
[3] The Census Bureau data on economics characteristics for the population by disability status
[4] Annual Statistical Supplement to the Social Security Bulletin, 2000, the Social Security Administration
[5] Chart Book: Social Security Disability Insurance by the Center on Budget and Policy Priorities

Disability programs with partial benefits for partially disabled people are common among the members of the Organization of Economic Cooperation and Development (OECD). Partial disability insurance programs exist in Australia, Germany, Japan, the Netherlands, and Norway. For example, in Norway, individuals receive partial disability insurance (DI) if their working capacity is reduced by 50% or more, and the amount of DI benefits is based on the precise percentage of an individual's capacity to work.[6] In the report Sickness, Disability and Work: Breaking the Barriers, the OECD recommends the US to adopt the best policies from other countries, introduce early interventions and access to support, and remove disincentives to work for the partially disabled.[7]

The number of SSDI beneficiaries varies from year to year, making it more challenging to keep the program's budget balanced. The number of SSDI recipients is particularly large during economic downturns. According to Maestas et al. (2021), the Great Recession led to almost 1,000,000 additional SSDI applications. The introduction of partial disability benefits can give people additional incentives to stay in the labor force even during recessions. This reform can decrease the amount of money spent on the SSDI program during economic crises when the government's budget is particularly tight.

This article aims to answer the following question. Will the mortality rate and disability propensity decrease due to the introduction of a disability insurance program for the partially disabled and consequent changes in income, health insurance coverage, and labor supply decisions? To this aim, I build and estimate a model that simulates labor supply and disability insurance application choices. By allowing for heterogeneous health effects of changes in income, health insurance, and labor supply, I simulate how individuals self-select into employment and disability insurance recipiency based on the different effects of those on their health. I use the Health and Retirement Study data. These data are representative of the US population only above 51 years old. As a result, I focus on these older individuals. This is not a significant drawback, as 77% of SSDI beneficiaries are in this age group.

[6] The Norwegian Labour and Welfare Administration

[7] OECD (2010) — Sickness, Disability and Work: Breaking the Barriers

I consider the following partial disability insurance reform. Under the reform, partially disabled can apply for partial disability insurance. To be eligible for partial disability insurance, the applicant must continue working, either full-time or part-time. Thus, this reform replaces existing incentives for partially disabled individuals to retire prematurely with the incentives to continue working. If the earnings of a partially disabled individual are higher than a certain amount of money, substantial gainful activity amount (Substantial Gainful Activity amount, as determined by SSA, was $1,130/month in 2018), then the partial DI benefits are reduced by $1 for each extra $1. A recipient of partial disability is not provided with health insurance but has insurance from the onset of full disability. If a partial disability beneficiary claims to be fully disabled, they can choose to stop working and apply for full benefits while receiving these full benefits for the period of application. If their application is approved, they continue receiving full benefits, whereas if it is not approved, they stop receiving any benefits. Like full disability insurance (DI) benefits, partial DI benefits have an age cap — full retirement age (FRA). Like existing full DI benefits, partial DI benefits are available only for those who are below FRA. In contrast with full DI program beneficiaries, partial DI program recipients are not automatically granted old-age benefits (OAB) upon reaching FRA and can claim OAB at an older age at their discretion.

Following this outlined partial disability insurance reform, partially disabled individuals increase their labor supply and do not retire prematurely. The effect of the reform on labor supply varies with age. The increase in the percentage of the partially disabled who work full-time is the largest for 51-year-olds. The share of the partially disabled who work part-time, on average, rises more than that of those who work full-time. For 58-year-olds, this former share skyrockets by 14 p.p.

These changes in labor supply decisions have positive effects on health dynamics. Disability propensity and mortality rates both decrease. These health effects of the reform also vary with age. The effect of the reform on the disability propensity is largest for 63-year-olds. Among 63-year-olds, the percentage of those without disabilities increases by about 1.2 p.p.

The decrease in the mortality rate is biggest for 60-year-old Americans. Their mortality rate declines by around 0.1 p.p. After 60, the mortality rate declines less and less, but the increase in survival rate continues growing and peaks at around 70 with about 1 p.p. increase. I perform back-of-the-envelope calculations based on these changes in percentages and the number of Americans of a given age in 2022. According to back-of-the-envelope estimates, thanks to the partial disability insurance reform, 30,000 Americans will extend their lives by 5 years, 20,000 Americans — by 15 years, and 10,000 Americans — by 20 years. The reform not only saves lives but also improves the quality of life, which is epitomized by the decrease in the total number of disabled elderly and near elderly by about 1%.

These health benefits will come with an increase in the cost of the SSDI program. However, this increase will be smoothened by a massive shift of the partially disabled from full to partial benefits and increased income taxes. Following the reform, $\sim$30% of the partially disabled who applied for full disability benefits will switch to applying for partial benefits. Due to the increased labor supply, income taxes will increase by 2%. After accounting for an increase in taxes, the expenditure required to extend the life of one person by a year is approximately $17,000. This is below common estimates of the value of one year of life (see Murphy and Topel, 2006), which are typically above $100,000.

Moreover, I analyze alternative designs of a partial disability insurance (DI) program. Namely, I examine how different sizes of benefits reductions due to earnings, early access to Medicare, supportive income during the onset of the full disability, and employment requirements change the health effects of the reform. Because most partial DI beneficiaries will work part-time and will not earn more than SGA, the reduction in benefits due to earnings has little effect on the reform's effect. Early access to Medicare also has little effect on the mortality rate as the partially disabled can receive health insurance from other sources, and the health effects of the health insurance are small. Finally, if the partial DI beneficiaries do not receive benefits during the application for the full DI benefits or if the employment requirements are lifted, the health effects of the reform are considerably smaller.

The rest of the paper is organized as follows. Section 2 reviews the related literature. Section 3 provides background information. Section 4 describes the data. Section 5 presents the model. Section 6 presents the estimation results. Section 7 discusses the outcomes of partial disability insurance reform. Section 8 examines alternative designs of the partial disability insurance reform. Section 9 concludes.

2 Literature Review

One of the most fundamental health and public economics questions is how income from government programs can influence beneficiaries' health. Many papers have focused on this research question. The conclusions widely depend on the context and the details of the designs of these programs. Most of the research focuses on the effects of health insurance on health, while the impact of disability insurance (DI) on health is much less analyzed.

The literature on the relationship between disability insurance and health is scarce and inconclusive. Ziebarth (2017) summarizes: "Despite the richness of the literature, there is a severe paucity of evidence on the short and long-term health effects of disability insurance." Several papers have concluded that receiving disability insurance benefits positively affects health (see, e.g., Meara and Skinner, 2011; Heiss et al., 2015; Gelber et al., 2023, etc.). In particular, Gelber et al. (2023) exploit "bend points" in DI payments formulas and conclude that an increase of $1,000 in annual DI payments decreases beneficiaries' probability of mortality over the next four years by 0.47 percentage points per year. However, another study concluded that DI does not impact physical health (see Borsch-Supan et al., 2017).

Meanwhile, other economists emphasize the heterogeneity of disability insurance effects on health (see, e.g., Garcia-Gomez and Gielen, 2018; Black et al., 2024). As regards Garcia-Gomez and Gielen (2018), they stressed that disability insurance affects the mortality of people of different genders in different ways. As for Black et al. (2024), they concluded the impact of SSDI on a recipient's mortality can depend on the severity of this person's disability. Black et al. (2024) analyzed the effects of the assignment of judges to SSDI cases.

For the marginal recipients who receive benefits only if seen by lenient judges, disability insurance benefit receipt increases mortality. However, mortality was reduced for those recipients who would receive benefits even if seen by a relatively strict judge. This might imply that truly disabled individuals benefit from current Social Security Disability Insurance, while those who could have been assigned partial disability insurance are harmed by the current SSDI policy.

All the papers to date analyze the effects of disability insurance on health using reduced-form empirical models. Researchers ran linear regressions with and without individual fixed effects and instrumental variable regressions to estimate these effects. For this purpose, economists also used regression kink and discontinuity designs. This paper aims to fill the gap in the literature by becoming the first paper to estimate the health effects of the receipt of disability insurance benefits using a structural model. Structural estimation permits the analysis of counterfactual scenarios that can not be analyzed using reduced-form methods. In particular, this article concentrates on the health effects of the counterfactual partial disability insurance policy.

The impact of disability insurance on labor force participation is much less ambiguous than that on health outcomes. Practically all the papers found this impact to be negative. Based on reduced form and structural estimations, various economists estimated how many people would remain in the labor force without the SSDI program (see, e.g., Maestas et al., 2013, French and Song, 2014, etc.). Their estimates are between one-fifth and one-third of current SSDI beneficiaries. The US has not experienced disability insurance system reforms for a long time. However, many other countries have. Multiple papers are devoted to the analysis of the consequences of such reforms (see, e.g., Gruber, 2000, and Jonsson et al., 2011). The common findings in this literature are that an increase in the size of benefits and a relaxation of eligibility criteria can decrease labor force participation. My contribution to this literature is a joint estimation and prediction of labor force participation and health outcomes.

The closest paper to this study is Yin (2015). This is the only study discussing the consequences of the introduction of partial benefits for the partially disabled in the US. Yin analyzes the effects of this modification on individuals' labor force supply and savings decisions. However, her paper does not focus on health outcomes. In her study, Yin takes survival rates from the 1997 US Life Tables and treats these rates as constants for each age of an individual. The only individual health-related characteristic that Yin uses in her research is a self-reported disability status that they do not use as an outcome variable. In contrast to her paper, this study analyzes how partial disability insurance (DI) benefits affect beneficiaries' health outcomes. In this article, I consider health-related variables as outcome variables.

While my study is the first to analyze the effects of disability insurance on health in a structural way, some papers have already analyzed the effects of health insurance on health (see, e.g., Hall and Jones, 2007, Yang et al., 2009, Blau and Gilleskie, 2008). Common findings in this literature are that extended coverage and more generous health insurance have positive effects on health-related outcomes and decrease mortality. The way I model health-related outcomes and their dynamics is close to Khwaja (2001).

Moreover, my paper builds on ideas from Poterba et al. (2013). Following Poterba et al. (2013), I created a health measure that aggregates self-reported health status, doctor-diagnosed health problems, difficulties in Activities of daily living (ADLs), and Instrumental Activities of daily living (IADLs), mental health problems (eight Center of Epidemiological Studies of Depression questions), and medical utilization. I call this health measure a health index. The data on these health problems, difficulties in ADLs and IADLs, and medical utilization are discrete. Consequently, the estimation of polychoric correlations is preferred (see Kolesnikov and Angeles, 2004). Therefore, I enhanced the method proposed by Poterba et al., 2013, by performing the polychoric principal component analysis (PCA) instead of an ordinal one.

This study is also related to the broader literature on the influence of health on retirement.

As a poor state of health and downward changes in health are among the main reasons for the exit from the labor force (see McGarry, 2004), partially disabled individuals might have an exceptionally high propensity to retire. Health can influence a desire to work in many ways. Firstly, poor health status might cause individuals to expect shorter lives. Such expectations will make these people less willing to accumulate more wealth, and these people will also be less productive (see Hamermesh, 1985). Secondly, the marginal utility of leisure can be raised relative to that of consumption due to bad health (see Capatina, 2015). Thus, partially disabled are more likely to leave the labor force regardless of partial SSDI benefits.

Some researchers looked at the reverse effect and analyzed the influence of retirement on health. The partially disabled might retire, given disability insurance that does not require them to continue working. Retirement has the potential to increase their well-being. However, several studies indicate that earlier exit from the labor force can worsen the lives of retirees in many different ways. Retirement increases mortality (see Snyder and Evans, 2006; Fitzpatrick and Moore, 2018; Kuhn et al., 2020; Wu et al., 2015; and Murayama et al., 2022). The negative effect on mortality is more significant for men than for women (see Fitzpatrick and Moore, 2018; Zulkarnain and Rutledge, 2018; Kuhn et al., 2020). Additionally, cognitive and mental health may suffer due to earlier retirement (see Rohwedder and Willis, 2010; Bonsang et al., 2012; Mazzonna and Peracchi, 2012; Börsch-Supan and Schuth, 2014). As there is growing evidence of the benefits of bridge employment (see, e.g., Cahill et al., 2015), the introduction of partial Disability Insurance benefits that provide additional motivation to get a part-time job before full retirement might be especially advantageous.

Summing up, this paper's idea builds on two results from the existing literature. Following the introduction of partial disability insurance, the partially disabled will increase their labor supply and retire at an older age (see Yin, 2015). Because of this, the mortality rate is expected to decrease (see Fitzpatrick and Moore, 2018; Wu et al., 2015; Zulkarnain and Rutledge, 2018; Kuhn et al., 2020). The questions are how much the mortality rate will decrease, how many lives will be saved, and how much money this will cost.

3 Background

Social Security Disability Insurance (SSDI) is a part of the United States safety net that targets people whose ability to work is affected by their health. The SSDI program provides benefits to disabled workers and their dependents. In 2019 around 10 million people received SSDI benefits.[8] These benefits totaled almost $145 billion.[9]

To receive Social Security Disability Insurance benefits, an individual must be insured, be younger than full retirement age (currently, it is 66 years and two months), have filed the application for benefits, and meet the definition of disability under the Social Security Act. As for the first requirement on being insured for benefits, a person must have worked enough and recently enough. As regards the last requirement on disability, the Social Security Act defines disability as "(A) inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than 12 months, or (B) in the case of an individual who has attained the age of 55 and is blind (within the meaning of blindness as defined in section 216(i)(1)), inability by reason of such blindness to engage in a substantial gainful activity requiring skills or abilities comparable to those of any gainful activity in which the individual has previously engaged with some regularity and over a substantial period of time."[10] A person is considered as being engaged in a substantial gainful activity (SGA) if they earn more than an SGA amount. In 2021 this amount is $1,310 per month.[11]

The Social Security Act of 1935 introduced the Social Security Disability Insurance program. Initially, the Act was crafted to pay benefits only to retired workers aged 65 and older. It was the Social Security Amendments (SSA) of 1956 that initiated the provision of benefits to the disabled. At first, only disabled workers 50 years and above were eligible. However,

[8] Annual Statistical Report on the Social Security Disability Insurance Program, 2019

[9] Chart Book: Social Security Disability Insurance by the Center on Budget and Policy Priorities

[10] Social Security Act, Title II, Section 223

[11] Substantial Gainful Activity, the Social Security Administration website

the SSA of 1958 broadened the SSDI program to provide benefits to workers' dependents, and the SSA of 1960 lifted this age requirement for disabled workers. The next significant change was introduced by the SSA of 1972. SSDI recipients who received disability insurance benefits for two consecutive years became eligible for Medicare. In the following years, enrollment into the SSDI program grew faster than expected, and the SSA of 1980 introduced a review process of initial SSDI decisions. The last major modification of the SSDI program was the Ticket to Work and Work Incentives Improvement Act of 1999. This Act allowed disabled people who returned to work to continue their Medicare coverage for a total of 93 months. The Act also allowed states to offer Medicaid buy-in for disabled workers even though they may no longer be eligible for SSDI benefits. In addition to these changes in Medicare and Medicaid eligibility, the Act introduced a Trial Work Period. SSDI recipients got an opportunity to keep their benefits while being engaged in a substantial gainful activity (SGA) for the first nine months.[12]

In the last 15 years, the Social Security Administration ran six demonstration projects to analyze how different modifications of the SSDI program can influence the well-being of participants.[13] Mental Health Treatment Study tested how better access to mental health treatment can improve labor market outcomes of SSDI recipients. A small proportion of SSDI beneficiaries, 14%, agreed to participate in this study. However, the positive effects of this intervention on labor supply and earnings of a treated group were significant.[14] Another project, Accelerated Benefits, tested whether the earlier provision of Medicare coverage can be beneficial for SSDI recipients. Participants extensively used early Medicare insurance coverage, which noticeably increased their healthcare utilization.[15] One other project was a Benefits Offset project. Based on this project, the Social Security Administration analyzed how a $1 reduction in benefits for every $2 earned above a substantial gainful activity amount can influence labor force participation decisions of disability insurance recipients.

[12] Ticket to Work Program Fact Sheet

[13] Demonstration projects conducted by the Social Security Administration

[14] Mental Health Treatment Study, Final Report

[15] Accelerated Benefits Demonstration project conducted by the Social Security Administration

That is, this program analyzed the effects of ex-post partial Social Security Disability Insurance benefits. Thus, the Benefits Offset project is very close to my paper as the latter studies ex-ante partial SSDI benefits. The Social Security Administration concluded that Benefits Offset modification did not noticeably change the labor supply of SSDI recipients while substantially increasing the program's costs.[16] One of the most recent projects, Youth Transition Demonstration, specifically targeted disabled individuals younger than twenty-five and aimed to increase their labor supply and earnings. The results of this intervention were ambiguous.[17] Finally, the SSA has two ongoing projects. One of these projects is the Supported Employment Demonstration project, which provides disabled individuals with additional training to help them return to work. Another one is the Promoting Opportunity Demonstration project. This project is based on the same idea as the Benefits Offset project but differs from a previous project in some technical details. A second attempt by the SSA to implement partial DI benefits shows how compelling the idea of partial benefits is for government officials. These projects aimed to boost employment and improve the health of SSDI recipients. Thus, the Social Security Administration acknowledges the shortcomings of the current SSDI policy regarding its health effects on participants and possible negative effects on their employment incentives.

As the Social Security Administration reported, several recent trends were difficult to anticipate.[18] A number of disabled-worker awards were rising sharply between 2007 and 2010 and was falling steeply between 2010 and 2015. The aging of baby boomers, the growth in the proportion of women insured for disability insurance benefits, and the declining mortality of disabled individuals all contributed to this recent increase in the disabled worker awards from 2007–2010. A consequent decline can be partially explained by an economic recovery after the Great Recession, the Affordable Care Act of 2010 that expanded health insurance coverage, and improvements in health and technology.

[16] Benefit Offset National Demonstration Implementation and Evaluation, Benitez-Silva et al. (2011)
[17] Youth Transition Demonstration project conducted by the Social Security Administration
[18] Briefing Paper No. 2019-01 by the Social Security Administration

Today, Social Security Disability Insurance benefits are received by approximately the same numbers of women and men. The percentage of SSDI beneficiaries increases with age for both men and women. 75% of SSDI recipients are older than 50, and the average age of SSDI receivers is approximately 55. Individuals without a college degree are much more likely to receive SSDI benefits.[19] In 2019, 33.6% of SSDI awards were granted based on the impairments of the musculoskeletal system and connective tissue, 29.4% — because of mental health disorders, 9.7% — due to disorders of the nervous system and sense organs, and 27.3% — based on of other reasons.[20]

Individuals are eligible for Social Security Disability Insurance benefits if they meet specific work and disability criteria.[21] The exact criteria are complex and depend on the SSDI applicant's medical condition, age, education, and work history. However, if an individual developed one of over 100 "listed impairments," SSDI benefits are immediately granted.[22] Throughout the recent decade, only around 21% of individuals were provided benefits during their initial claims. In the case when an application is rejected, appeals are possible. The final award rate for claims filed during the recent decade is 32%.[23] Thus, the demand for disability insurance in the United States of America is much higher than the supply.

The Social Security Administration defines Social Security benefits as Primary Insurance Amounts (PIA). PIA depends on Average Indexed Monthly Earnings (AIME). The Social Security Administration uses up to 35 years of earnings in AIME calculation. According to the SSA, for an individual who first becomes eligible for Old-Age Insurance benefits or disability insurance (DI) benefits in 2022, PIA will be the sum of 90% of the first $1,024 of their AIME, 32% of their AIME over $1,024 and through $6,172, and 15% of their AIME over $6,172.[24] This sum, furthermore, is subject to a family maximum.[25,26]

[19] Chart Book: Social Security Disability Insurance by the Center on Budget and Policy Priorities
[20] Annual Statistical Report on the Social Security Disability Insurance Program, 2019
[21] How you qualify for Social Security disability benefits
[22] Listings of impairments
[23] Annual Statistical Report on the Social Security Disability Insurance Program, 2019
[24] A PIA formula
[25] A formula for family maximum benefit for Old-Age Insurance benefits
[26] A formula for the maximum benefit of a disabled-worker family

Social Security Disability Insurance recipients can stop receiving benefits due to the following reasons: they turn the full retirement age (this is 66 years and two months in 2021), and their Social Security Disability Insurance benefits are transformed into Social Security Old-Age benefits, they earn above the significant gainful activity (SGA) amount for an extended period of time (0.6% of SSDI beneficiaries lost their disability insurance benefits because of this in 2019), they were regarded as medically able to engage in a SGA after a disability review (0.4% of SSDI recipients had their benefits terminated because of this reason in 2019), they died (2.4% of SSDI benefits receivers died in 2019), or due to some other reasons (in 2019, 0.2% of SSDI recipients' benefits were terminated due to other reasons). Thus, once individuals receive Social Security Disability Insurance benefits, they are unlikely to lose them. If an individual is granted Social Security Disability Insurance benefits, typically, they receive these benefits up to the point when they turn their full retirement age and start receiving Social Security Old-Age benefits. Consequently, the cost of a type one error in the SSDI decision process for the government is high.

4 Data and Summary Statistics

4.1 Data and Sample Design

The datasets used in this study are the cross-sectional Health and Retirement Study (HRS) Public Survey data and RAND HRS Longitudinal File. HRS is a national longitudinal biennial household survey of individuals over age 51 and their spouses. This study is conducted by the Institute for Social Research at the University of Michigan. More than 15,000 individuals who comprise more than 10,000 households are surveyed every two years. Sampling weights constructed by the University of Michigan provide consistent sample attrition and mortality adjustment. The RAND HRS Longitudinal File is a cleaned data containing information from HRS, with derived and imputed variables covering an extensive range of topics. The list of all variables used is presented in Appendix A.

The estimation sample consists of observations between 1994 and 2016, except for 2004. In the 2004 wave, the questions on disabilities were not asked of those who had disabilities in the previous wave. Due to this, for the 2004 wave, the transitions between different disability statuses can not be analyzed. The health and Retirement Study sample is not representative of the United States population below 51. Therefore, I exclude observations on individuals below 51 years old. I focus on individuals below 90 years old as the effects of the proposed reform on mortality vanish by the point a person turns 90. Thus, I also delete all observations on individuals older than 90. Finally, I delete observations with missing data in the initial period of observation, as well as a few observations with missing information on age.

4.2 Measures of Health Outcomes, Healthy and Unhealthy Behaviors

Health and Retirement Study has a variety of health-related variables. I construct and use two health measures. Where is the second? Introduce both. My first health measure is based on the following questions:

1. Do you have any impairment or health problem that limits the kind or amount of paid work you could do?

2. Does this limitation keep you from working altogether?

I classify individuals who state that they do not have any impairment or health problem that limits the kind or amount of paid work they could do as healthy individuals, those who argue that they have impairments that limit their work but do not prevent them from working altogether as partially disabled, and those who claim that they have limitations keeping them from working altogether as fully disabled.

Table 1 presents the health transition probabilities for the estimation sample. People are more likely to have the same level of disability as in the previous period. Those who have a partial disability are more likely to become fully disabled than those without a disability, and those with a full disability are less likely to recover than those with a partial disability.

Also, when a person's level of disability is higher, she is more likely to die. Specifically, the biennial mortality rate for people without disabilities is only 0.005%, while it is two and a half times higher (0.012%) for those with a partial disability and three and a half times higher (0.018%) for those who are fully disabled.

While Yin (2015) fully relies on these two questions mentioned above to analyze health, this paper focuses on the health effects of reforms to the Social Security Disability Insurance program. Therefore, I also construct a health index based on various other health-related variables. Similar to Poterba et al. (2013), I chose 30 HRS variables to derive a health measure using principal component analysis (PCA). The selected variables are related to self-reported health status, mental health, doctor-diagnosed diseases, functional limitations, and medical utilization.

Like Poterba et al. (2013), I choose the standardized and inversed prime principal component that explains the biggest share of the variance as one of my health measures. I call this health measure a health index. Unlike Poterba et al. (2013), I use polychoric PCA, which takes into account the discreteness of the variables. My health index has several valuable properties:

- The health index is very persistent and is predictive of the onsets of full and partial disabilities and death (see Figure 1).
- A health index predicts mortality and other bad health events well (see Figure 2).

4.3 Summary Statistics

The decision-making process in my model stops when individuals turn 70 years old. Therefore, in Table 2, I compare the summary statistics for respondents aged from 51 to 70 from my estimation sample with the summary statistics for those from the sample of all HRS respondents within this age range. In total, there are 137,612 observations of HRS respondents between 51 and 70 years old. The estimation sample consists of 121,348 observations. The averages for the estimation sample and full sample are reasonably close.

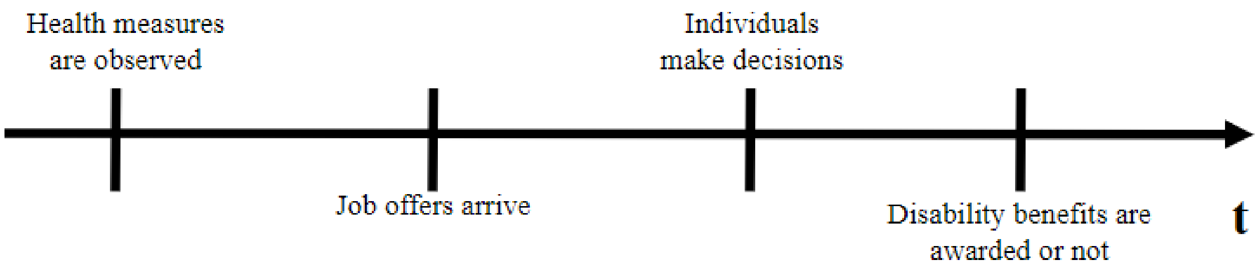
Around 39% work full-time, only 17% of the partially disabled work full-time, while among not disabled individuals, this percentage is about 50%. Approximately 15.5% work part-time. Partially disabled people are also less likely to work part-time in comparison with those without disabilities, 15% and 18%, respectively. Around 6.5% are receiving Social Security Disability Insurance (SSDI) benefits, and about 1.3% are applying for SSDI. Among the fully disabled, this percentage is higher than among partially disabled, around 8.5% and about 3.6%, correspondingly. Approximately 16% of respondents are partially disabled, and around 10% are fully disabled. Annual non-zero earnings are approximately $52,000. Earnings data are in 2018 US Dollars. The average age of respondents within this age range is around 60 years, and the average percentage of college-educated respondents is about 21.5%.

5 The Model

The dynamic behavioral model that I develop and estimate describes how individuals make decisions over their lifetime about work and Social Security benefits applications. My model builds on Yin (2015), who introduced the first structural model to examine the relationship between SSDI application decisions and labor supply choices. I adjusted her model of individuals' labor supply decisions to analyze the health effects of disability insurance. Disability insurance affects health through three channels: employment, amount of consumption, and health insurance coverage. The effects of employment, consumption, and health insurance coverage are heterogeneous for the targeted group of the population — the partially disabled. The partially disabled consider the health effects of their decisions when self-selecting into employment and disability insurance. The model does not have an analytic solution. Therefore, the model is solved numerically by backward recursion. The model solution is described in Appendix B.

5.1 Timing and initial conditions

In the model, individuals are aged from 51, t_{min}, to 90, t_{max}. By age 70, t_R, individuals retire and stop making choices. In each period, disability status and health index are observed at first. Next, job offers arrive. Consequently, individuals make their decisions, described in the following subsection. Following this, the Social Security Administration awards SSDI.



The set of initial conditions,

$$\Omega_{t_0} = \{t_0, SSDI^i_{t_0}, D^i_{t_0}, H^i_{t_0}, AIME^i_{t_0}, a^i_{t_0}, e^i\},$$

consists of the initial year of observation, t_0, SSDI recipiency, $SSD^i_{t_0}$, statuses, their disability, $D^i_{t_0}$, health index, $H^i_{t_0}$, average income monthly earnings, $AIME^i_{t_0}$, the age of an individual, $a^i_{t_0}$, and education, e^i, during the initial period of observation.

5.2 Decisions and an Information Set

Forward-looking agents between 51, t_{min}, and 70, t_R, make annual decisions, Z^i_t, about:

- Employment: full-time $work^i_t = F$, part-time $work^i_t = P$, no work $work^i_t = N$
- Application for Social Security Disability Insurance benefits: $apply^i_t = FD$ if an individual is eligible for full SSDI benefits and claims them, $apply^i_t = PD$ if an individual is eligible for partial SSDI benefits and claims them, $apply^i_t = NO$, o/w.
- Start receiving Social Security Old-Age benefits: $start^i_t = 1$ if an individual is eligible for Social Security Old-Age benefits and starts receiving them, $start^i_t = 0$, o/w.

Individuals make these choices, Z_t^i, based on information, Ω_t:

- Endogenous outcome variables:
  - SSDI and Social Security Old Age (SSOA) decisions: $SSD_{t-1}^i = FD$ if an individual is awarded and receives full SSDI benefits, $SSD_{t-1}^i = PD$ if an individual is awarded and receives partial SSDI benefits, $SSD_{t-1}^i = OA$ if an individual started receiving SSOA benefits in the previous period, $SSD_{t-1}^i = NO$, o/w
  - Disability status: $D_t^i = F$ if fully disabled, $D_t^i = P$ if partially disabled, $D_t^i = N$ if not disabled
  - Health index: H_t^i
  - Health insurance: I_t^i
  - Average indexed monthly earnings: $AIME_t^i$
- Exogenous variables:
  - Education: $e^i = 1$ for college graduates and $e^i = 0$, o/w
  - Age: a_t^i
  - Year: t.

5.3 The Utility Functions of the Agents

The per-period utility function of an agent, $u_t^i(\cdot)$, has the following form:

$$u_t^i(S_t^i) = ln(C_t^i)\Big(1 + \alpha_L^P 1_{work_t^i=P} + \alpha_L^{PH} 1_{work_t^i=P}\tilde{H}_t^i + \alpha_L^F 1_{work_t^i=N} + \alpha_L^{FH} 1_{work_t^i=N}\tilde{H}_t^i +$$

$$+\alpha_W^F 1_{work_t^i=F} 1_{D_t^i=P} + \alpha_W^{FH} 1_{work_t^i=F} 1_{D_t^i=P}\hat{H}_t^i + \alpha_W^P 1_{work_t^i=P} 1_{D_t^i=P} + \alpha_W^{PH} 1_{work_t^i=P} 1_{D_t^i=P}\hat{H}_t^i +$$

$$+\alpha_O^N start_t^i 1_{D_t^i=N} + \alpha_O^{NH} start_t^i 1_{D_t^i=N}\tilde{H}_t^i + \alpha_O^P start_t^i 1_{D_t^i=P} + \alpha_O^{PH} start_t^i 1_{D_t^i=P}\tilde{H}_t^i +$$

$$+\alpha_O^F start_t^i 1_{D_t^i=F} + \alpha_O^{FH} start_t^i 1_{D_t^i=F}\tilde{H}_t^i\Big) + (\alpha_B^P 1_{apply_t^i=F} 1_{D_t^i=P} + \alpha_B^{PH} 1_{apply_t^i=F} 1_{D_t^i=P}\tilde{H}_t^i +$$

$$+\alpha_B^F 1_{apply_t^i=F} 1_{D_t^i=F} + \alpha_B^{FH} 1_{apply_t^i=F} 1_{D_t^i=F} \tilde{H}_t^i)(1-start_t^i)(1-1_{SSD_t^i=OA})+$$

$$+(\alpha_F^P 1_{apply_t^i=F} 1_{D_t^i=P} + \alpha_F^{PH} 1_{apply_t^i=FD} 1_{D_t^i=P} \tilde{H}_t^i + \alpha_F^F 1_{apply_t^i=FD} 1_{D_t^i=F} + \alpha_F^{FH} 1_{apply_t^i=FD} 1_{D_t^i=F} \tilde{H}_t^i) start_t^i +$$

$$+(\alpha_S^P 1_{apply_t^i=FD} 1_{D_t^i=P} + \alpha_S^{PH} 1_{apply_t^i=FD} 1_{D_t^i=P} \tilde{H}_t^i + \alpha_S^F 1_{apply_t^i=FD} 1_{D_t^i=F} + \alpha_S^{FH} 1_{apply_t^i=FD} 1_{D_t^i=F} \tilde{H}_t^i) 1_{SSD_t^i=OA} +$$

$$+(\alpha_T^P 1_{apply_t^i=FD} 1_{D_t^i=P} + \alpha_T^{PH} 1_{apply_t^i=FD} 1_{D_t^i=P} \tilde{H}_t^i + \alpha_T^F 1_{apply_t^i=FD} 1_{D_t^i=F} + \alpha_T^{FH} 1_{apply_t^i=FD} 1_{D_t^i=F} \tilde{H}_t^i) 1_{SSD_{t-1}^i=OA} +$$

$$+\alpha_R^F 1_{work_t^i=F} 1_{work_{t-1}^i=N} + \alpha_R^{HF} 1_{work_t^i=F} 1_{work_{t-1}^i=N} \hat{H}_t^i + \alpha_R^P 1_{work_t^i=P} 1_{work_{t-1}^i=N} + \alpha_R^{HP} 1_{work_t^i=P} 1_{work_{t-1}^i=N} \hat{H}_t^i +$$

$$+(\alpha_N^{PF} 1_{work_t^i=F} 1_{work_{t-1}^i=P} + \alpha_N^{FP} 1_{work_t^i=P} 1_{work_{t-1}^i=F}) 1_{D_t^i=N} +$$

$$+(\alpha_P^{PF} 1_{work_t^i=F} 1_{work_{t-1}^i=F} + \alpha_P^{FP} 1_{work_t^i=F} 1_{work_{t-1}^i=P}) 1_{D_t^i=P}.$$

The utility derived from consumption varies with employment, disability, and SSOA statuses, $work_t^i$, D_t^i, $start_t^i$, and the health index, H_t^i, $\tilde{H}_t^i = max(\texttt{\{H\}\^{}i\_t}) + H_t^i$, $\hat{H}_t^i = \texttt{min(\{H\}\^{}i\_t)} - H_t^i$. The health index is transformed in such a way that everyone receives utility benefits from leisure and utility costs from applications and working while disabled. Those with a higher health index receive higher utility benefits from leisure, higher utility costs from the SS application, and lower utility costs from working while disabled. Agents also bear utility costs from returning to part-time or full-time work after not working and applying for SS benefits. Individuals make decisions while they are between 51, t_{min}, and 70, t_R. To account for all unobserved factors preceding the initial period of observation, the utility of individuals in this initial period is adjusted by

$$\tilde{u}_{t_{min}}^i(S_{t_{min}}^i) = \alpha_{t_{min}}^{FP} 1_{work_t^i=F} 1_{D_t^i=P} + \alpha_{t_{min}}^{PP} 1_{work_t^i=P} 1_{D_t^i=P} + \alpha_{t_{min}}^{AP} 1_{apply_t^i=F} 1_{D_t^i=P} \tilde{H}_t^i + \alpha_{t_{min}}^{AF} 1_{apply_t^i=F} 1_{D_t^i=F} \tilde{H}_t^i.$$

When individuals turn 70, t_R, they additionally receive the utility of bequest:

$$\tilde{u}_b^i(S_b^i) = \alpha_b^R 1_{SSD_t^i=OA} + \alpha_b^{RP} 1_{SSD_t^i=OA} 1_{D_t^i=PD} + \alpha_b^{RF} 1_{SSD_t^i=OA} 1_{D_t^i=FD} +$$

$$+\alpha_b^A 1_{apply_t^i=OA} + \alpha_b^{AP} 1_{apply_t^i=OA} 1_{D_t^i=PD} + \alpha_b^{AF} 1_{apply_t^i=OA} 1_{D_t^i=FD}.$$

If individuals die before 70, they receive terminal value, $\alpha_{terminal}$.

5.4 Social Security Benefits

To be eligible for full SSDI benefits, a person should be not working partially or fully disabled. The likelihood of the award of these benefits, $\pi_t^{ai} = \pi^a(D_t^i, H_t^i, a_t^i, e^i)$, is assumed to depend on the disability status, D_t^i, health index, H_t^i, age dummy variables, education, e^i, where π^a is a logistic function. The size of Social Security benefits, SSB_t^i, depends on the Social Security Administration decision, SSD_t^i, Average Indexed Monthly Earnings, $AIME_t^i$, and the current year, $SSB_t^i = SSB(SSD_t^i, AIME_t^i, t)$.

Under the proposed counterfactual partial disability insurance reform, partially disabled individuals will become eligible for partial benefits from Social Security Disability Insurance. Partially disabled applying for partial SSDI benefits are assumed to experience the same utility cost of application as the fully disabled applying for full disability insurance. If the earnings are higher than the SGA amount (Substantial Gainful Activity amount was \$1,130/month in 2018), then the benefits are reduced. The award probability of partial disability benefits for partially disabled individuals is, on average, the same as that of full disability benefits for fully disabled of the same age and education status.

5.5 Health Measures

Future health index, $H_{t+1}^i = H(D_t^i, work_t^i, I_t^i, C_t^i, H_t^i, a_{t+1}^i, e^i, \epsilon_{t+1}^{Hi})$, is simulated based on current disability status, D_t^i, employment status, $work_t^i$, health index H_t^i, age, a_{t+1}^i, college education, e^i, and health shock, $\epsilon_{t+1}^{Hi} \overset{\text{iid}}{\sim} N(0, \sigma_H^2)$, and $H(\cdot)$ — linear function. Thus,

$$H_{t+1}^i = \beta^{HC} + \beta_t^{HPFi} 1_{D_t^i=PD} \cdot 1_{work_t^i=FT} + \beta_t^{HPPi} 1_{D_t^i=PD} \cdot 1_{work_t^i=PT} + \beta_t^{HPIi} 1_{D_t^i=PD} \cdot I_t^i + \beta_t^{HPCi} 1_{D_t^i=PD} \cdot C_t^i +$$

$$+ \beta^{HNF} 1_{D_t^i=ND} \cdot 1_{work_t^i=FT} + \beta^{HNP} 1_{D_t^i=ND} \cdot 1_{work_t^i=PT} + \beta^{HNI} 1_{D_t^i=ND} \cdot I_t^i + \beta^{HNC} 1_{D_t^i=ND} \cdot C_t^i +$$

$$+ \beta^{HFI} 1_{D_t^i=FD} \cdot I_t^i + \beta^{HFC} 1_{D_t^i=FD} \cdot C_t^i + \beta^{HF} 1_{D_t^i=FD} + \beta^{HP} 1_{D_t^i=PD} + \beta^{HH} H_t^i +$$

$$+\beta^{HA}a_{t+1}^{i} + \beta^{HE}e^{i} + \beta^{HFE}1_{work_t^i=FT} \cdot e^{i} + \beta^{HPE}1_{work_t^i=PT} \cdot e^{i} + \epsilon_{t+1}^{Hi},$$

where β_t^{HPJi}, $J \in \{F, P, I, C\}$ are heterogeneous:

$$\beta_t^{HPJi} = \gamma^{HJ} + \epsilon_t^{HJi},\ \epsilon_t^{HJi} \overset{\text{iid}}{\sim} N(0, \sigma_{HJ}^2).$$

The health index is then censored to be between the maximum and the minimum health index in the data. The future disability status and mortality rate, D_{t+1}^i and π_{t+1}^{mi}, depend on the same variables as H_{t+1}^i, $D_{t+1}^i = D(work_t^i, D_t^i, H_t^i, a_{t+1}^i, e^i, \epsilon_t^{DJi})$, and $\pi_{t+1}^{mi} = \pi^m(work_t^i, D_t^i, H_t^i, a_{t+1}^i, e^i, \epsilon_t^{MJi})$, but $D(\cdot)$ and $\pi^m(\cdot)$ are logistic function. If some individual is predicted to be both fully disabled and partially disabled, full disability dominates partial disability. After individuals turn 70, t_R, they stop making decisions and are assumed to be not working. Only health equations are modeled. The mortality rate starts to depend on age quadratically.

5.6 Health Insurance

Health insurance is modeled as a dummy variable, I_t^i, representing enrollment in any health insurance before age 65 when everyone becomes eligible for Medicare. Individuals can be enrolled in private health insurance, early Medicare (through SSDI), or Medicaid.

The probability of enrollment into a private health insurance program in the current period depends on the same variables as health measures in the next period. When individuals receive SSDI in the previous period, they automatically receive early Medicare in the current period. Finally, the probability of enrollment into Medicaid depends on health measures, age, and consumption. If an individual is enrolled in any of these programs, $I_t^i = 1$, and $I_t^i = 0$ otherwise.

5.7 Earnings and Income

Annual earnings, W_t^i, are:

$$W_t^i = \beta_W^C + \beta_W^F 1_{work_t^i=F} + \beta_W^H H_t^i + \beta_W^A a_t^i + \beta_W^E e^i + \beta_W^{FP} 1_{work_t^i=FT} \cdot 1_{D_t^i=PD} + \beta_W^{FE} 1_{work_t^i=FT} \cdot e^i + \epsilon_{t+1}^{Wi}.$$

The earnings depend on whether they work full-time or not, $work_t^i$, their disability status, D_t^i, health index, H_t^i, age, a_t^i, education, e^i, and earnings shock, $\epsilon_{t+1}^{Wi} \overset{\text{iid}}{\sim} N(0, \sigma_W^2)$.

The income of an individual is the sum of earnings and SSDI benefits:

$$Y_t^i = W_t^i + SSB_t^i.$$

If income is lower than the annual cost of food stamps in 2018, then the income is equal to this cost.

5.8 The Maximization Problem of the Agents

The maximization problem of an individual:

$$V_t^i(\Omega_t^i;\ Z_t^i;\ \tilde{\epsilon}_t^i) = \max_{Z_t^i}(u^i(S_t^i) + \beta E(V_{t+1}^i(\Omega_{t+1}^i;\ Z_{t+1}^i;\ \tilde{\epsilon}_{t+1}^i)))$$

s.t.

$$C_t^i = Y_t^i,$$

where $\tilde{\epsilon}_{t+1}^i$ — a vector of shocks to the effects of full-time and part-time work, health insurance, and consumption on the health of the partially disabled, and shocks to health index and earnings.

6 Estimation

The model parameters are estimated using the Method of Simulated Moments (MSM). This section discusses the average marginal effect (AME) of the main variables and model fit. 197 estimated parameters and 367 moments are presented in Appendix C.

6.1 Average Marginal Effects

Table 3 shows the AME of the main variables on health transition probabilities for the partially disabled. Full-time work, increases in consumption, and health insurance coverage all have negative AME on mortality and full and partial disability probabilities. Part-time work, on average, also decreases mortality and partial disability probability, but it increases the full disability probability. As shown in Appendix C, working people, on average, are healthier than non-working ones. The former people are healthier than the latter because of their self-selection into employment and the effects of employment on health. A positive AME of part-time work shows that a lower full disability rate for part-time working partially disabled results from self-selection of healthier partially disabled into part-time work.

The effects (β_t^{KJi}) of full-time (FT) and part-time (PT) employment, changes in consumption amounts (C), and health insurance coverage (I) on mortality probability (M), partial disability probability (P) and full disability probability (F) for the partially disabled are heterogeneous: $\beta_t^{KJi} = \gamma^{KJ} + \epsilon_t^{KJi},\ \epsilon_t^{KJi} \overset{\text{iid}}{\sim} N(0, \sigma^2_{KJ}),\ K \in \{M, P, F\}, J \in \{FT, PT, C, M\}$. Table 3 presents not only the AME of the constant component, γ^{KJ}, but also the average *absolute* marginal effect of ϵ_t^{KJi}.

The estimates of average *absolute* marginal effects of ϵ_t^{KJi} show the heterogeneity of the effects of labor supply decisions, consumption amounts, and health insurance coverage on health status transition probabilities. All partially disabled decrease their mortality probability by working either full-time or part-time. Full-time employment also decreases disability probabilities, while part-time employment effects on disability probabilities are more ambigious.

Consumption and health insurance coverage have lower effects on mortality and disability probabilities than labor supply decisions. This has consequences for the optimal reform of the SSDI. Given these estimates, the optimal reform should motivate the partially disabled to continue working. By staying in the labor force for a longer time, the partially disabled will be less likely to develop a full disability and less likely to die.

6.2 Model fit

A model has a very good fit. Figures 3–6 show the shares of individuals satisfying the criteria outlined in each graph. Shares are calculated for individuals of each possible age. The graphs on the left correspond to shares calculated based on the Health and Retirement Study (HRS) data, while the graphs on the right correspond to shares estimated based on the simulated data. Figure 3 shows the average shares of partially and fully disabled individuals applying for SSDI benefits and the average shares of those who receive SSDI benefits. The fully disabled individuals are more likely to apply for SSDI benefits than the partially disabled ones in the simulated data to around the same extent as in the HRS data. Figure 4 reports the shares of people working full-time or part-time by the disability status. While non-disabled people are more likely to work full-time than part-time, partially disabled are as likely to work part-time as to work full-time. Figure 5 shows the average earnings and the shares of SSOA recipients. The average earnings of the partially disabled are consistently ∼$20,000 lower than those of the non-disabled. Only when Americans start receiving old-age benefits at 62, and the massive retirement process starts, will the average earnings for the non-disabled become close to the earnings of the partially disabled. Finally, Figure 6 displays the shares of individuals who are partially or fully disabled and the survival rate. All graphs based on simulated data resemble those based on HRS data.

7 Partial Disability Insurance Reform

As Figure 7 shows, under the partial disability insurance reform outlined in section 5.4, the partially disabled increase their labor supply. As a result, people are less likely to become partially disabled or fully disabled and are more likely to live longer lives. Figure 8 shows the decrease in the propensity of individuals to become fully and partially disabled and the increase in the survival rate. At age 63, the reduction in the share of disabled individuals is around 1.2 p.p, and the decrease in annual mortality rate is 0.1 p.p. The increase in survival rate peaks at 70 years old is approximately 1 p.p. Back-of-the-envelope calculations based on these percentages and the numbers of Americans of a given age in 2022[27] show that the reform can save about $30,000$ lives of 70-year-olds, and the number of 63-year-olds fully disabled Americans decreases by around $50,000$ people. The age distribution of changes in survival rate and disability propensity and corresponding changes in the number of people who are not disabled and the number of lives saved are presented in Figure 9. Figure 10 shows the effect of the partial disability insurance reform on life longevity. About 30,000 Americans will extend their lives by 5 years, 20,000 Americans — by 15 years, and 10,000 Americans — by 20 years.

These health improvements will come with the cost of an increase in the total sum of benefits. The number of partially disabled applying for disability insurance benefits doubles. The total number of SSDI applications increases by approximately 50%. A drastic increase in the number of applications will not come with a drastic increase in the program's cost. ∼30% of the partially disabled who received full benefits now will choose to receive partial ones. Then, the amount of benefits awarded will rise only by about 25%. Most of this increase in the program's cost is canceled by the additional taxes collected from people who increase their labor supply. After accounting for taxes, the investment necessary to prolong the life of one person by one year is around $17,000. This is lower than common estimates of the value of one year of life, which typically (see Murphy and Topel, 2006) exceeds $100,000.

[27] I use US Census estimates of the population and of its age distribution

8 Alternative Designs of Partial Disability Insurance Reform

I analyze the health effects of four alternative designs of partial disability insurance reform (see Figures 11–15 and Table 4). Under the first one, the benefits are reduced by \$1 for each \$2 earned above the SGA amount (Substantial Gainful Activity amount was \$1,130/month in 2018) instead of \$1 for each \$1 earned above the SGA amount as under primary version of the reform. The partial disability insurance reform provides labor supply incentives to those partially disabled who otherwise would stay out of the labor force due to the low wages. Thus, those partially disabled who increase their labor supply because of the reform earn a little. Most partial disability insurance beneficiaries work part-time and do not earn more than SGA. As a result, the labor supply and health effects of this version of partial disability insurance reform are very close to those of the primary version of the reform. As benefits are more generous, after taking into account an increase in taxes, the cost of extending the life of one person by one year rises to about \$20,000.

Under the second alternative, the recipients are provided early access to Medicare. The partially disabled can have health insurance not only from the SSDI program, but they can also have private health insurance and Medicaid. With the low health effects of health insurance on health (see Table 3), the health improvements due to early access to Medicare relative to a primary version of the reform are small. With early access to Medicare, the cost of extending one life by one year increases to around \$40,000.

Under the third alternative design of partial disability insurance reform, the partially disabled do not have financial support if they become fully disabled and must apply for full disability insurance within one period. As a result, the health effects are considerably smaller. However, this version of the reform will require only \$3,000 for prolonging the life of one person by one year. The increase in taxes will completely cover the increase in benefits.

Finally, the fourth alternative design of the reform does not have work requirements. The health effects of this alternative are even smaller, while the cost of the reform skyrockets. The expenses necessary to prolong the life of one person by one year rise to around \$105,000.

9 Conclusion

The partial disability insurance reform in the US can lead to considerable health benefits for Americans. The current SSDI program motivates partially disabled people to pretend to be fully disabled and retire earlier. If partial disability insurance, such that it motivates partially disabled people to continue working, is introduced, then these people will considerably increase their labor supply and postpone retirement. As a result, the full disability propensity and mortality rate will decrease. Back-of-the-envelope calculations show that thanks to the reform, 30,000 Americans will extend their lives by 5 years, 20,000 Americans — by 10 years, and 10,000 Americans — by 15 years. The reform can also improve the quality of life by decreasing the number of disabled people. The overall number of disabled seniors will decrease by 1%. The number of disability insurance applications will increase by 50%. However, the total amount of benefits awarded to recipients will increase only by about 25%, as around 30% of the partially disabled people who received full benefits will choose to receive partial ones. Most of this rise in the cost of the SSDI program will be canceled out by additional taxes collected from people who increased their labor supply because of the reform. After taking an increase in taxes into account, the expenses necessary to prolong the life of one person by one year is approximately $17,000, which is below common valuations of one year of life.

References

Autor, D. H., and Duggan, M. G. (2006). The growth in the social security disability rolls: a fiscal crisis unfolding. Journal of Economic Perspectives, 20(3), 71–96.

Benitez-Silva, H., Buchinsky, M., Chan, H. M., Cheidvasser, S., & Rust, J. (2004). How Large Is the Bias in Self-Reported Disability? Journal of Applied Econometrics, 19(6), 649–670. http://www.jstor.org/stable/25146315.

Benitez-Silva, H., Buchinsky, M., and Rust, J. (2011). Induced Entry Effects of a $1 for $2 Offset in DI Benefits, Manuscript, Stony Brook University, UCLA, and University of Maryland.

Black, B., French, E., McCauley, J., and Song, J. (2024). The effect of disability insurance receipt on mortality. Journal of Public Economics, 229, 105033.

Blau, D.M., and Gilleskie, D.B. (2008). The Role of Retiree Health Insurance in the Employment Behavior of Older Men. International Economic Review 49 (2):475–514.

Bonsang, E., Adam, S., and Perelman, S. (2012). Does retirement affect cognitive functioning? Journal of Health Economics, 31(3), 490–501.

Börsch-Supan, A., and Schuth, M. (2014). Early Retirement, Mental Health, and Social Networks. In Discoveries in the Economics of Aging (pp. 225–254). University of Chicago Press.

Cahill, K. E., Giandrea, M. D., and Quinn, J. F. (2015). Retirement patterns and the macroeconomy, 1994–2010: The prevalence and determinants of bridge jobs, phased retirement, and reentry among three recent cohorts of older Americans. The Gerontologist, 55, 384– 403. doi:10.1093/geront/gnt146.

Capatina, E. (2015). Life-cycle effects of health risk, Journal of Monetary Economics, Volume 74, Pages 67–88, https://doi.org/10.1016/j.jmoneco.2015.06.002.

Fitzpatrick, M. D., and Moore, T. J. (2018). The mortality effects of retirement: Evidence from social security eligibility at age 62. Journal of Public Economics, 157, 121-137.

French, E., and Jones, J. B., (2011): "The Effects of Health Insurance and Self-Insurance on Retirement Behavior," in Econometrica, vol. 79, issue 3, 693–732.

French, E., and Song, J., (2014). The Effect of Disability Insurance Receipt on Labor Supply. American Economic Journal: Economic Policy 6 (2): 291–337.

Garcia-Gomez, P., and Gielen, A. C. (2018). Mortality effects of containing moral hazard: Evidence from disability insurance reform. Health economics, 27(3), 606–621.

Gelber, A., Moore, T., Pei, Z., and Strand, A. (2023). Disability insurance income saves lives. Journal of Political Economy, 131(11), 3156-3185.

Golosov, M., and Tsyvinski, A. (2006). Designing optimal disability insurance: A case for asset testing. Journal of Political Economy, 114(2), 257–279.

Gruber, J. (2000). Disability insurance benefits and labor supply. Journal of Political Economy, 108(6), 1162–1183.

Hall, R. E., and Jones, C. I. (2007). The value of life and the rise in health spending. The Quarterly Journal of Economics, 122(1), 39–72.

Haller, A., Staubli, S., and Zweimüller, J. (2020). Designing Disability Insurance Reforms: Tightening Eligibility Rules or Reducing Benefits. NBER Working Paper No. w27602.

Hamermesh, D. S. (1985). Expectations, Life Expectancy, and Economic Behavior. The Quarterly Journal of Economics, 100(2), 389–408. https://doi.org/10.2307/1885388

Heiss, F., Venti, S., and Wise, D. A. (2015). The Effect of the Receipt of Disability Insurance Benefits on Health. NBER DRC Working Paper No. NB14-04.

Jonsson, L., Palme, M., and Svensson, I. (2011). Disability insurance, population health and employment in Sweden (no. w17054).

Kennedy, J., Wood, E. G., & Frieden, L. (2017). Disparities in insurance coverage, health services use, and access following implementation of the Affordable Care Act: a comparison of disabled and nondisabled working-age adults. INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 54, 0046958017734031.

Khwaja, A. W. (2001). Health insurance, habits and health outcomes: A dynamic stochastic model of investment in health. University of Minnesota.

Kuhn, A., Staubli, S., Wuellrich, J. P., and Zweimüller, J. (2020). Fatal attraction? Extended unemployment benefits, labor force exits, and mortality. Journal of Public Economics, 191, 104087.

Meara, E., and Skinner, J. (2011). The Dynamics of Disability: Evidence from a Cohort of Back Pain Patients (No. orrc11-09). NBER.

Maestas, N., Mullen, K. J., and Strand, A. (2013). Does disability insurance receipt discourage work? Using examiner assignment to estimate causal effects of SSDI receipt. American Economic Review, 103(5), 1797–1829.

Maestas, N. (2019). Identifying work capacity and promoting work: A strategy for modernizing the SSDI program. The ANNALS of the American Academy of Political and Social Science, 686(1), 93–120.

Maestas, N., Mullen, K. J., and Strand, A. (2021). The effect of economic conditions on the disability insurance program: Evidence from the great recession, Journal of Public Economics, Volume 199, https://doi.org/10.1016/j.jpubeco.2021.104410.

Mazzonna, F., and Peracchi, F. (2012). Aging, cognitive abilities, and retirement. European Economic Review, 56(4), 691–710.

McGarry, K. (2004). Health and retirement: Do changes in health affect retirement expectations? Journal of Human Resources, 39, doi:10.3368/jhr.XXXIX.3.624.

Murayama, H., Takase, M., Watanabe, S., Sugiura, K., Nakamoto, I., and Fujiwara, Y. (2022). Employment in old age and all-cause mortality: A systematic review. Geriatrics & Gerontology International, 22(9), 705-714. https://doi.org/10.1111/ggi.14449.

Murphy, K. M., and Topel, R. H. (2006). The value of health and longevity. Journal of Political Economy, 114(5), 871-904.

Rohwedder, S., and Willis, R. J. (2010). Mental retirement. The Journal of Economic Perspectives, 24, 119-–138. doi:10.1257/jep.24.1.119.

Snyder, S. E., and Evans, W. N. (2006). The effect of income on mortality: evidence from the social security notch. The Review of Economics and Statistics, 88(3), 482-495.

Wu, C., Odden, M.C., Fisher, G.G., Stawski, R.S. (2016). Association of retirement age with mortality: a population-based longitudinal study among older adults in the USA. Journal of Epidemiology and Community Health, 70(9), doi: 10.1136/jech-2015-207097.

Yang, Z., Gilleskie, D.B., and Norton, E.C. (2009). Health Insurance, Medical Care, and Health Outcomes: A Model of Elderly Health Dynamics. Journal of Human Resources 44 (1):47–114. http://dx.doi.org/10.3368/jhr.44.1.47.

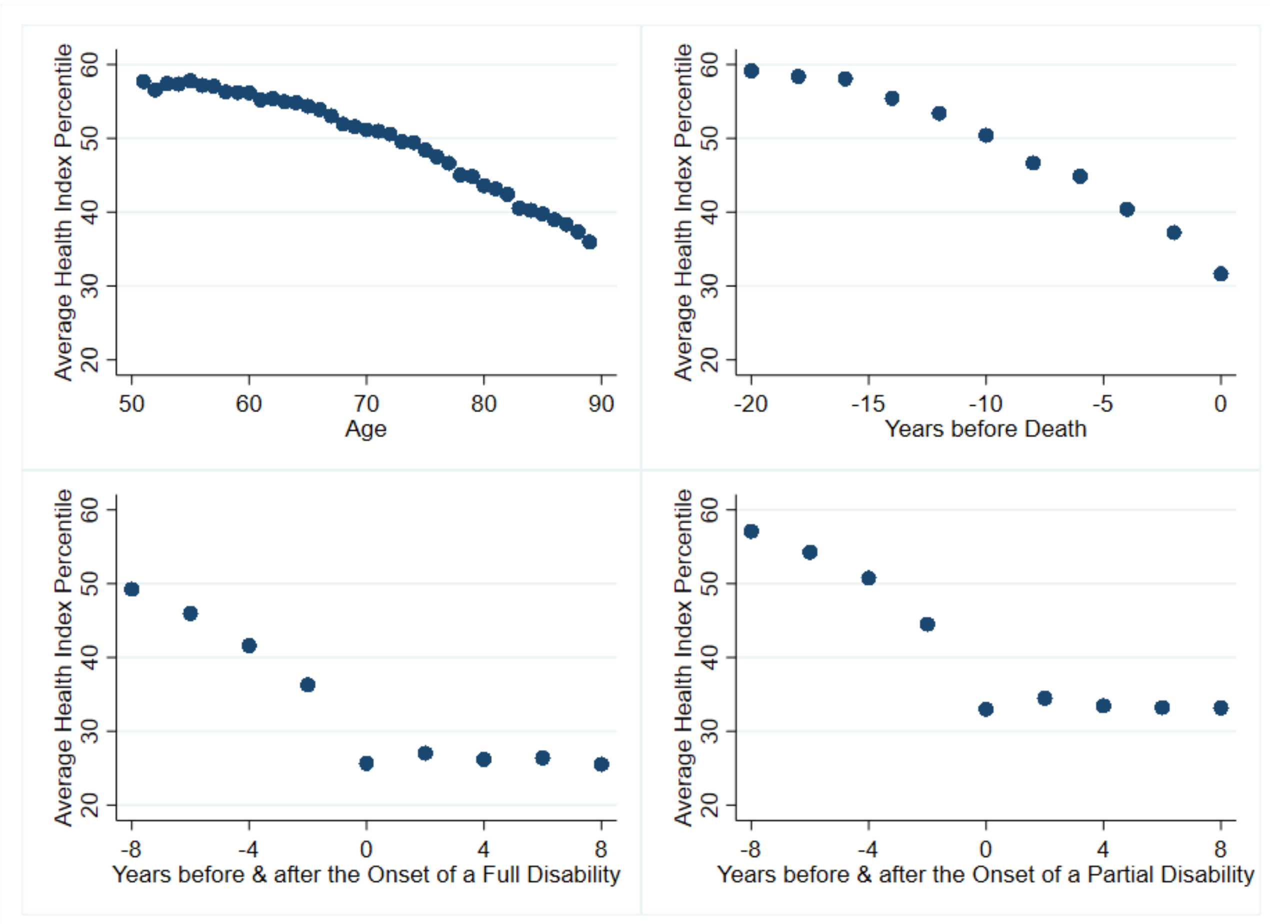
Yin, N. (2015). Partial benefits in the social security disability insurance program. Journal of Risk and Insurance, 82(2), 463–504.

Ziebarth, N. R. (2017). Social insurance and health. Health Econometrics.

Zulkarnain, A., and Rutledge, M. S. (2018). How does delayed retirement affect mortality and health? Center for retirement research at Boston College, CRR WP, 11.

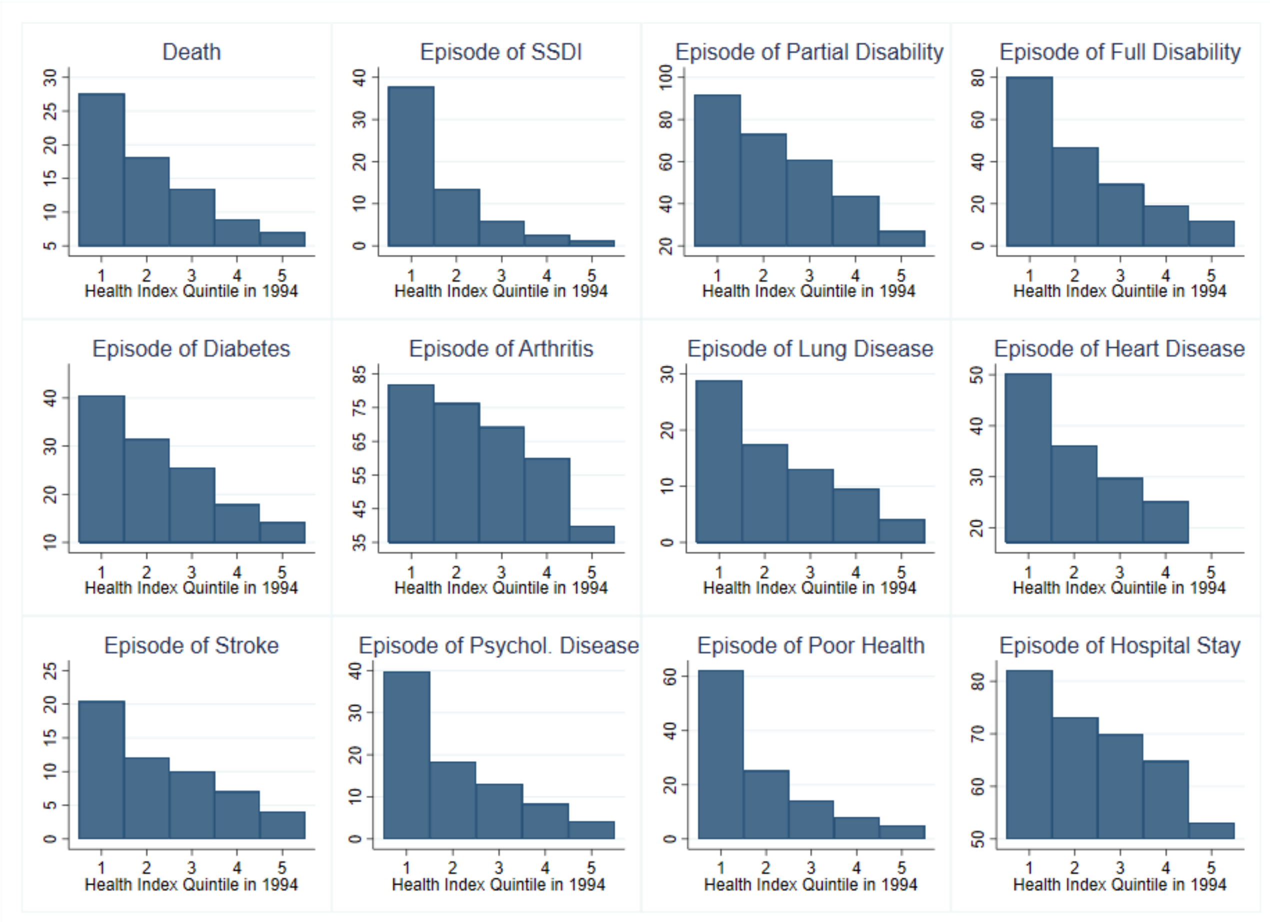
Figures

Figure 1 Health Index Dynamics



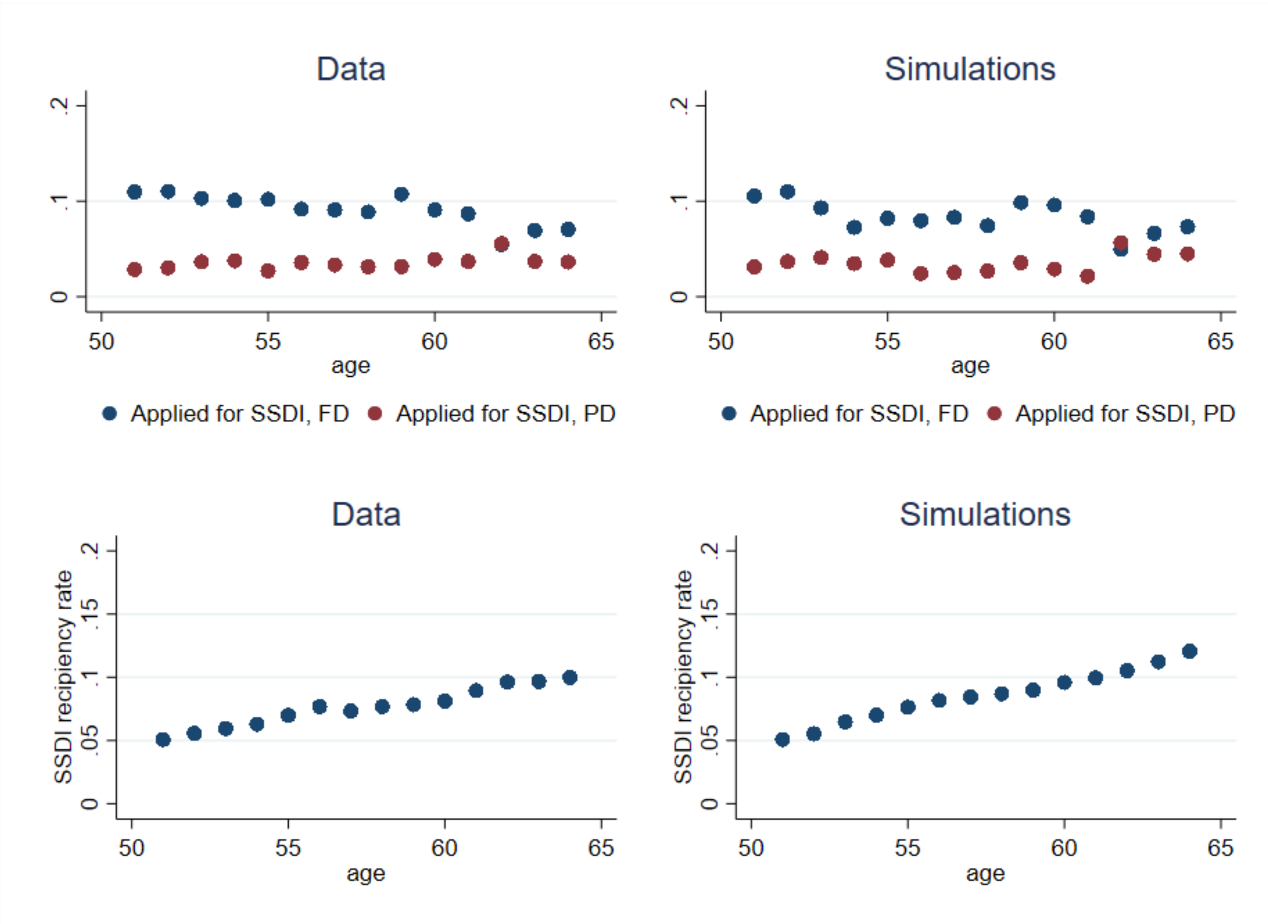
Notes: Figure 1 shows the dynamics of the health index over a lifetime and during the onset of partial and full disabilities. The dots show the average percentile of a health index by age or year. The graphs are based on RAND HRS Longitudinal file data and cross-sectional HRS Public Survey Data for the years between 1994 and 2016.

Figure 2 The Percentage of HRS Respondents Who Experienced Health Events by 2010 by Health Index Quintile in 1994



Notes: Figure 2 demonstrates the predictive power of a health index. Respondents with a lower health index in 1994 were more likely to experience negative health outcomes by 2010. The graphs are based on RAND HRS Longitudinal file data and cross-sectional HRS Public Survey Data for the years between 1994 and 2016.

Figure 3 Model Fit - SSDI Applications and Recipiency

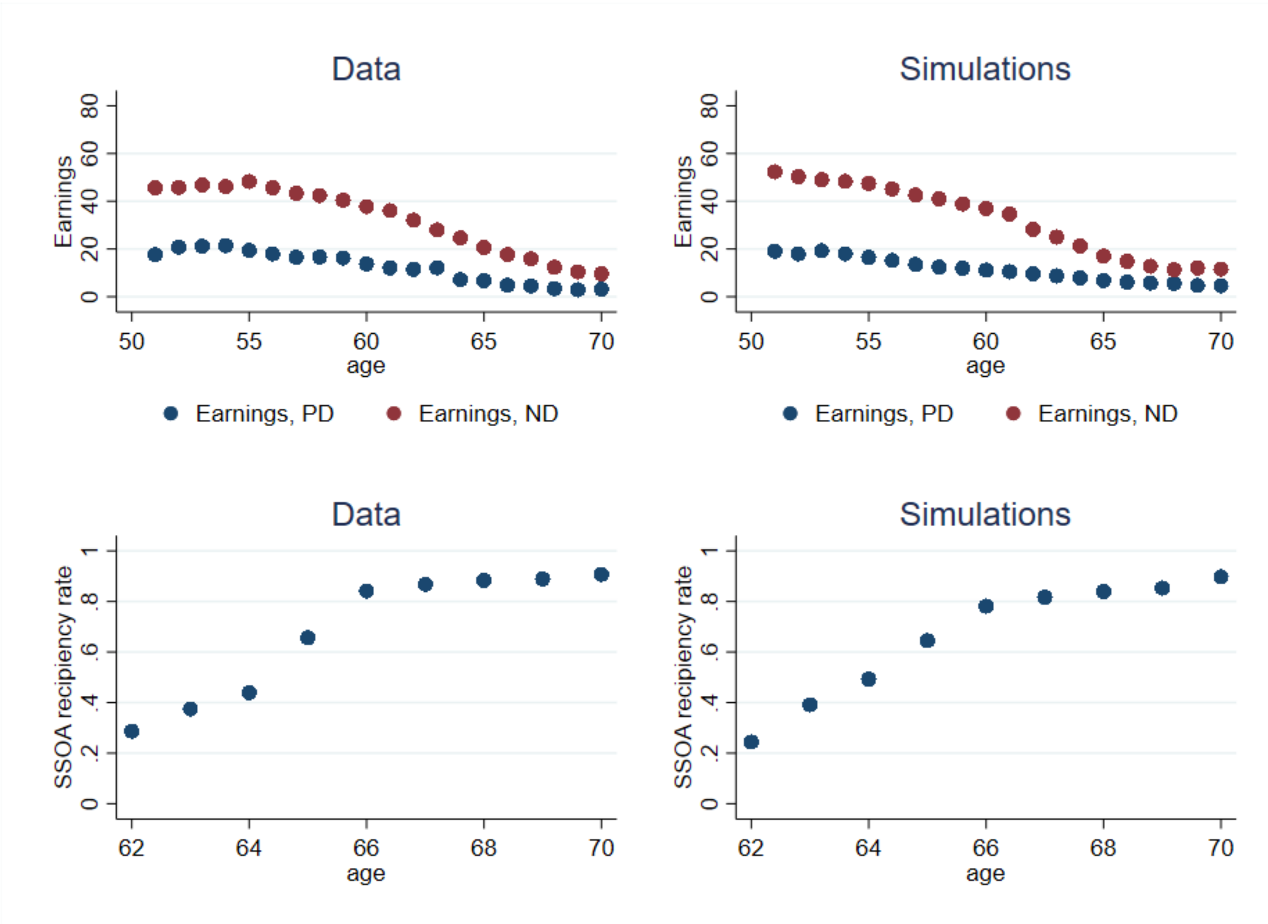


Notes: Figure 3 shows the average shares of individuals applying for SSDI or receiving SSDI at a given age in the HRS data and simulated data. "Applied, PD" stands for the shares of individuals who applied while partially disabled, and "Applied, FD" stands for the shares of individuals who applied while being fully disabled. Americans can apply and receive SSDI until they turn full retirement age (FRA), 65 or 66 years for respondents in my data. After FRA, disability benefits are automatically transformed into old age benefits.

Figure 4 Model Fit - Labor Supply Decisions

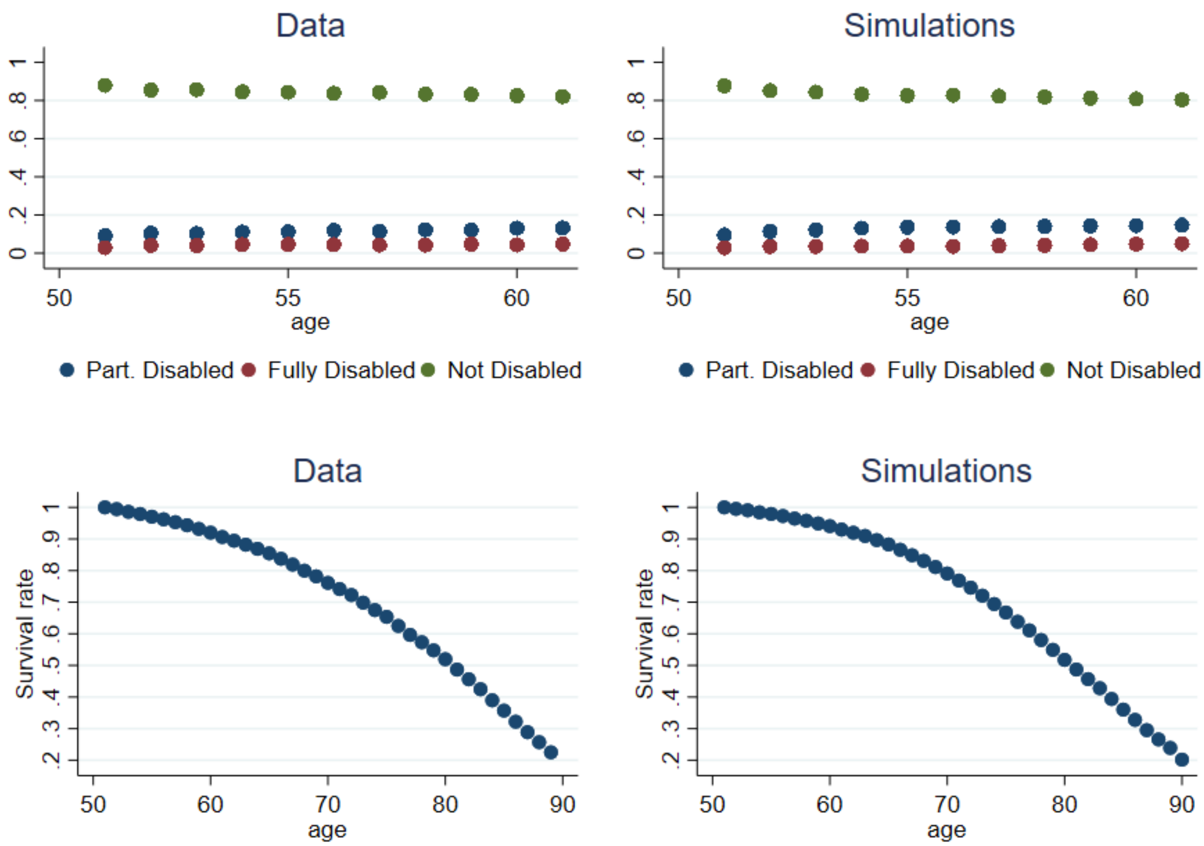
Notes: Figure 4 shows the model fit of labor supply decisions. The dots on the graphs in the first row show the average shares of not disabled (ND) individuals working full-time or part-time, while the dots on the graphs in the second row show average shares of partially disabled (PD) individuals working full-time or part-time. Individuals in the model are 51 and above and make labor supply decisions until they are 70. The graphs on the left are based on HRS Data, and the graphs on the right are based on simulated data.

Figure 5 Model Fit - Earnings and Social Security Old-Age Recipency



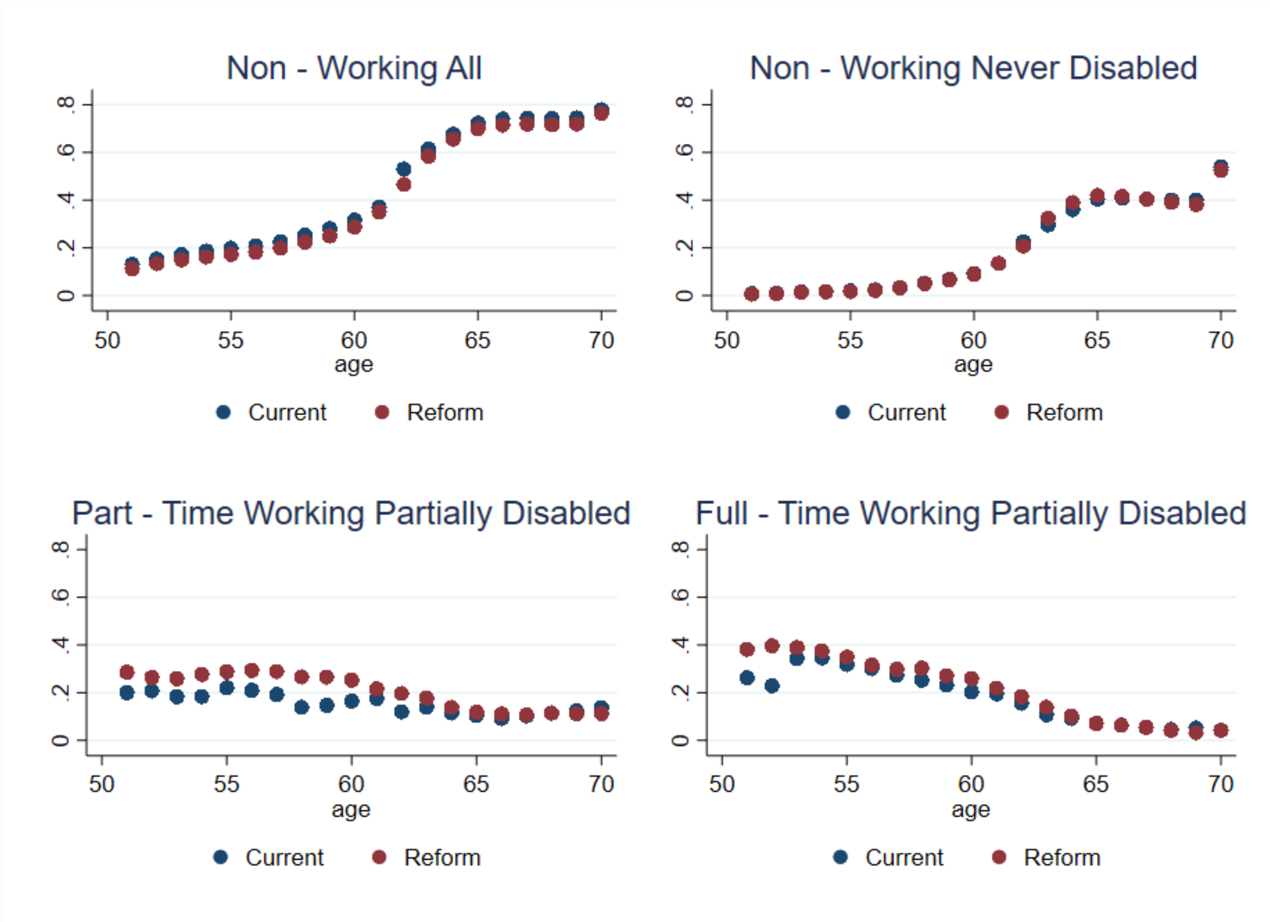
Notes: Figure 5 shows the model fit for earnings and Social Security Old-Age recipiency rate. The dots on the graphs in the first row show the average earnings in thousands of 2018 US dollars, while the dots on the graphs in the second row show average shares of the individuals who have already claimed Social Security Old Age benefits. Individuals in the model are 51 and above and make labor supply decisions until they are 70. The graphs on the left are based on HRS Data, and the graphs on the right are based on simulated data.

Figure 6 Model Fit - Disability Status and Survival Rate



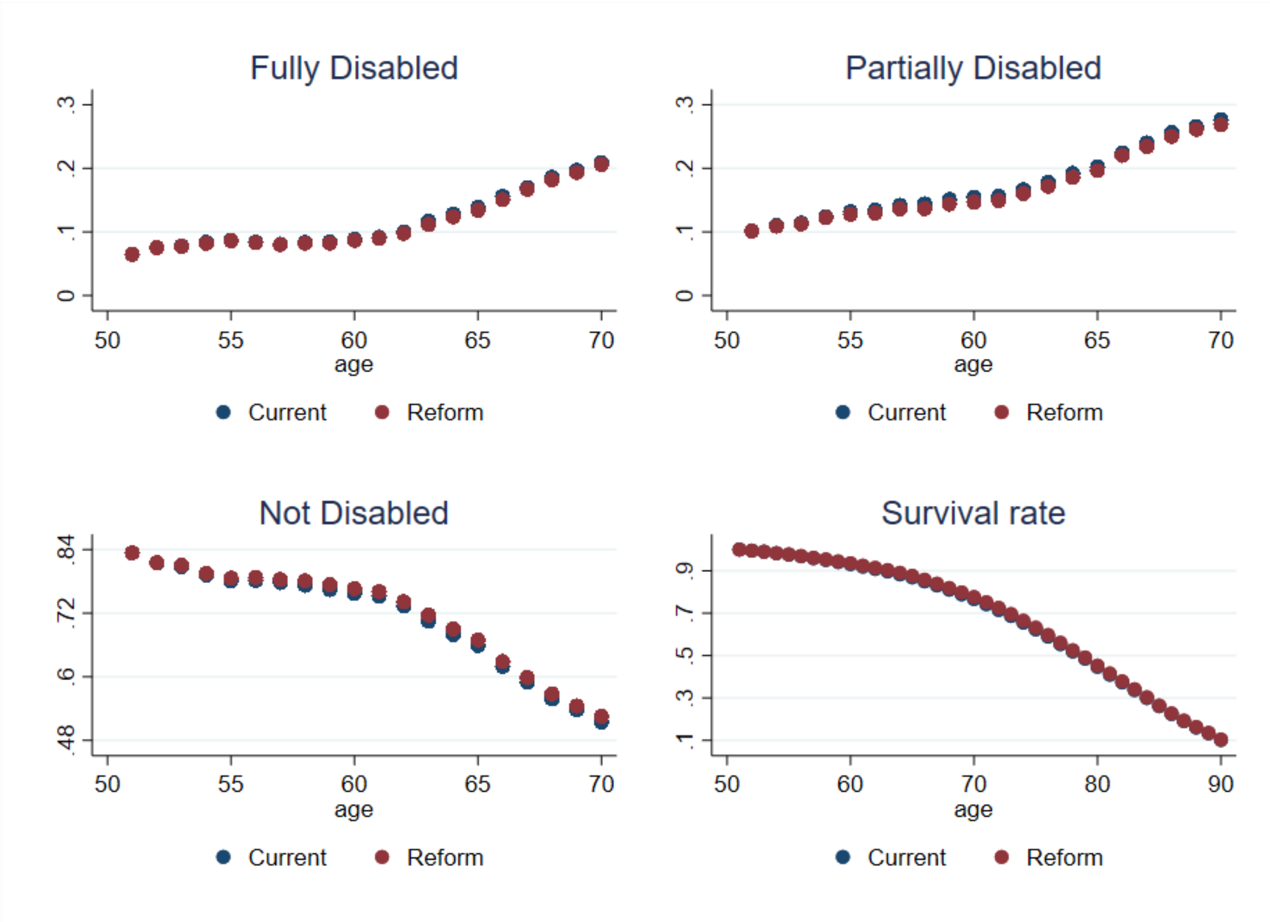
Notes: Figure 6 shows the model fit for disability and survival rates. The dots on the graphs in the first row show the average shares of individuals who are partially disabled, fully disabled, or not disabled, while the dots on the graphs in the second row show the survival rate at each age. The massive retirement process that starts when individuals turn 62 affects their answers to questions about disability. As a result, I focus on the shares of disabled people below 62. The graphs on the left are based on HRS Data, and the graphs on the right are based on simulated data.

Figure 7 Simulated Labor Supply under Current SSDI Policy and After Partial Disability Insurance Reform



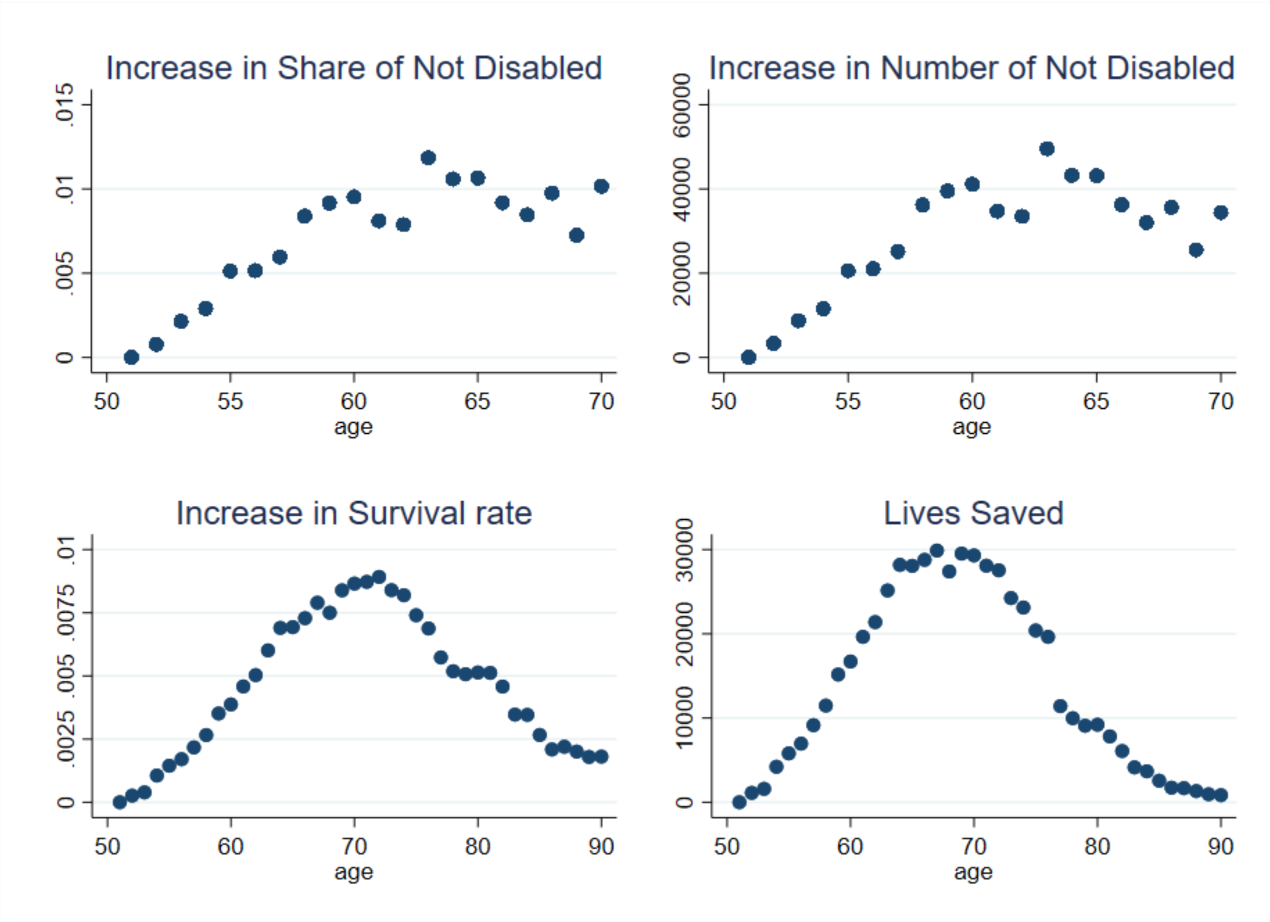
Notes: Figure 7 shows the effects of the introduction of disability insurance for the partially disabled on labor supply decisions. The dots show the shares of individuals who are not working (top left graph), the shares of never-disabled individuals who are not working (top right graph), the shares of partially disabled working part-time (bottom left graph), and the shares of partially disabled working full-time (bottom right graph). The shares are calculated based on simulations under the current SSDI policy and after the partial disability insurance reform. Individuals in the model are 51 and above and make labor supply decisions until they are 70.

Figure 8 Impact of the Partial Disability Insurance Reform on Disability Propensity and Survival



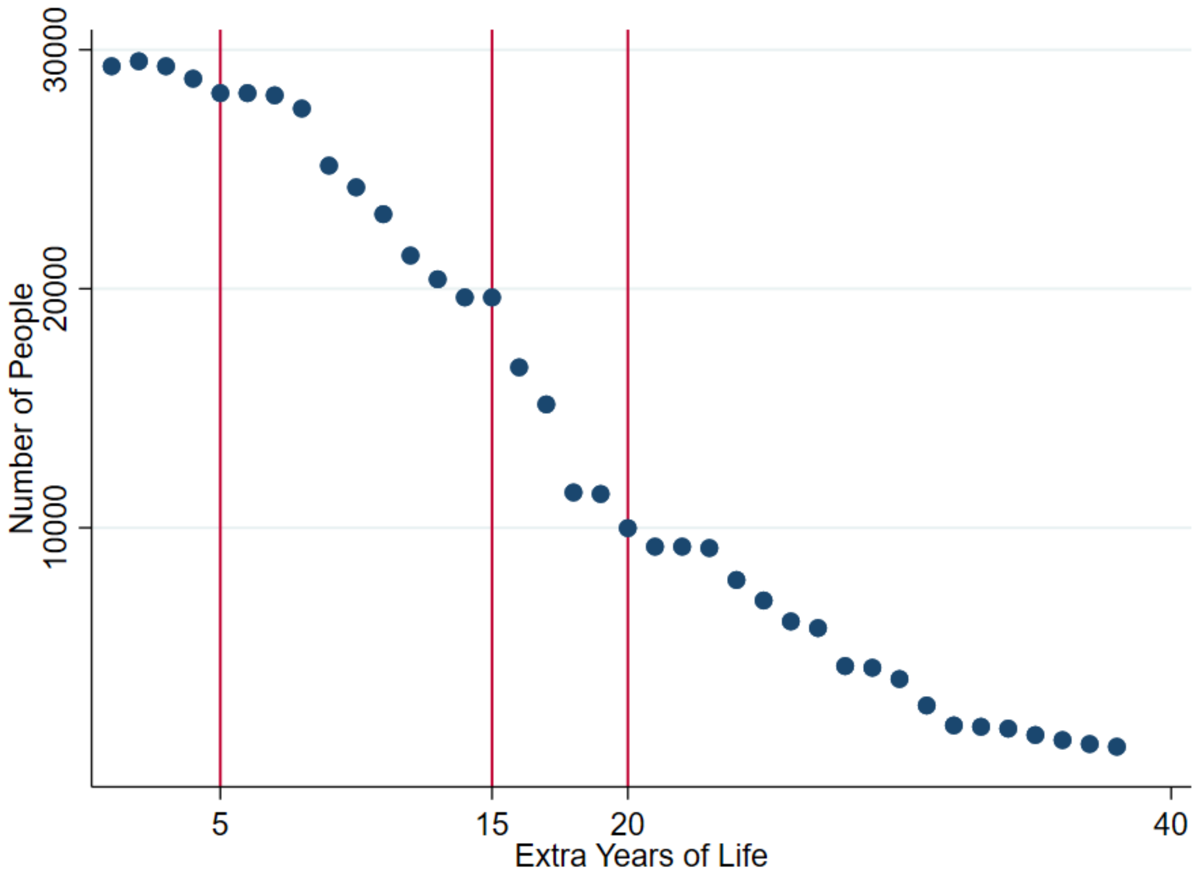
Notes: Figure 8 shows how the share and the number of disabled Americans and the survival rate will change after the introduction of partial disability insurance in the US. The dots in the graphs in the top row show decreases in the shares of fully and partially disabled Americans, while the dots in the graphs in the bottom row show an increase in the share of non-disabled Americans and an increase in the survival rate. Changes in shares are calculated based on simulations under existing SSDI policy and under counterfactual partial disability insurance reform. The disability status analyzed refers to a person's ability to work. Given that the individuals in the model are 51 and above and make labor supply decisions until they are 70, the graphs on changes in disability are for individuals between 51 and 70.

Figure 9 Impact of the Partial Disability Insurance Reform on Disability Propensity and Survival



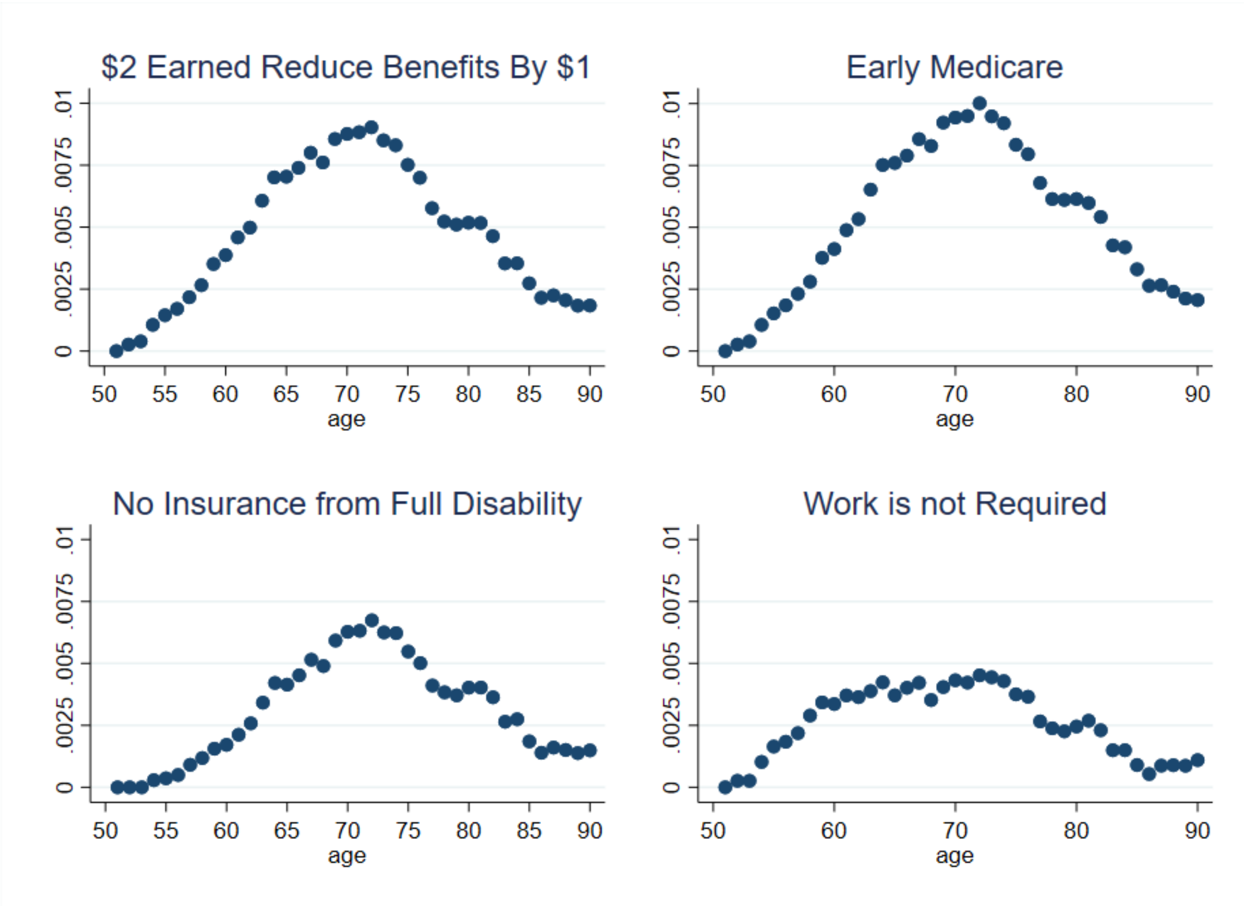
Notes: Figure 9 shows how the share and the number of disabled Americans and the survival rate will change after the introduction of partial disability insurance in the US. The dots in the graphs in the top row show increases in the shares and numbers of not-disabled Americans, while the dots in the graphs in the bottom row show an increase in the survival rate and the number of lives saved. Changes in shares and numbers are calculated based on simulations under existing SSDI policy and under counterfactual partial disability insurance reform. Increases in the number of not disabled Americans and the number of lives saved are estimated based on the changes in shares and the US Census estimates of the population and of its age distribution.

Figure 10 Impact of the Partial Disability Insurance Reform on Life Longevity



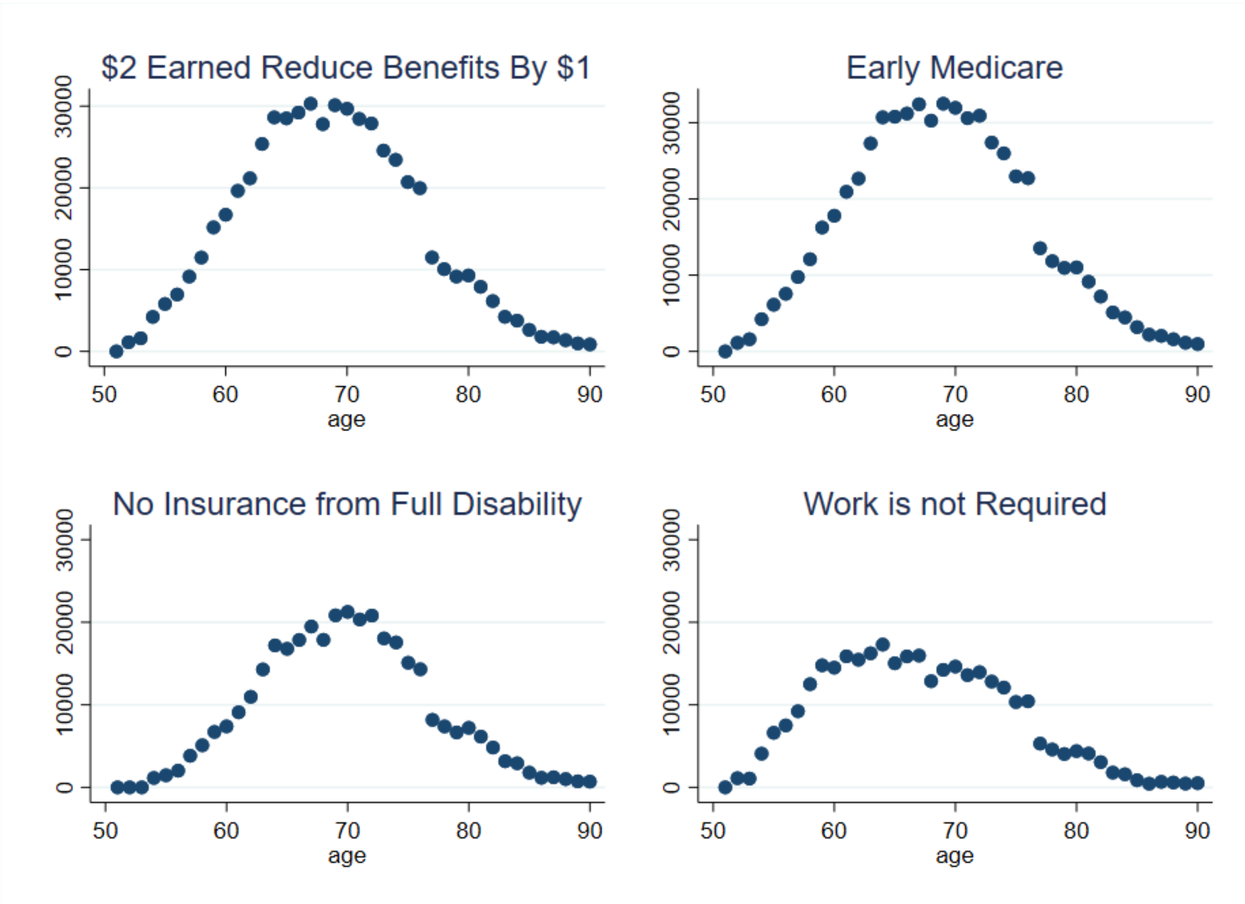
Notes: Figure 10 shows the impact of the partial disability insurance reform on life longevity. Around 30,000 people will extend their lives by 5 extra years, approximately 20,000 — by 15 extra years, and about 10,000 — by 20 extra years. The numbers of lives saved are estimated based on the changes in shares and the US Census estimates of the population and of its age distribution.

Figure 13 Impact of the Partial Disability Insurance Reform on Survival Rate



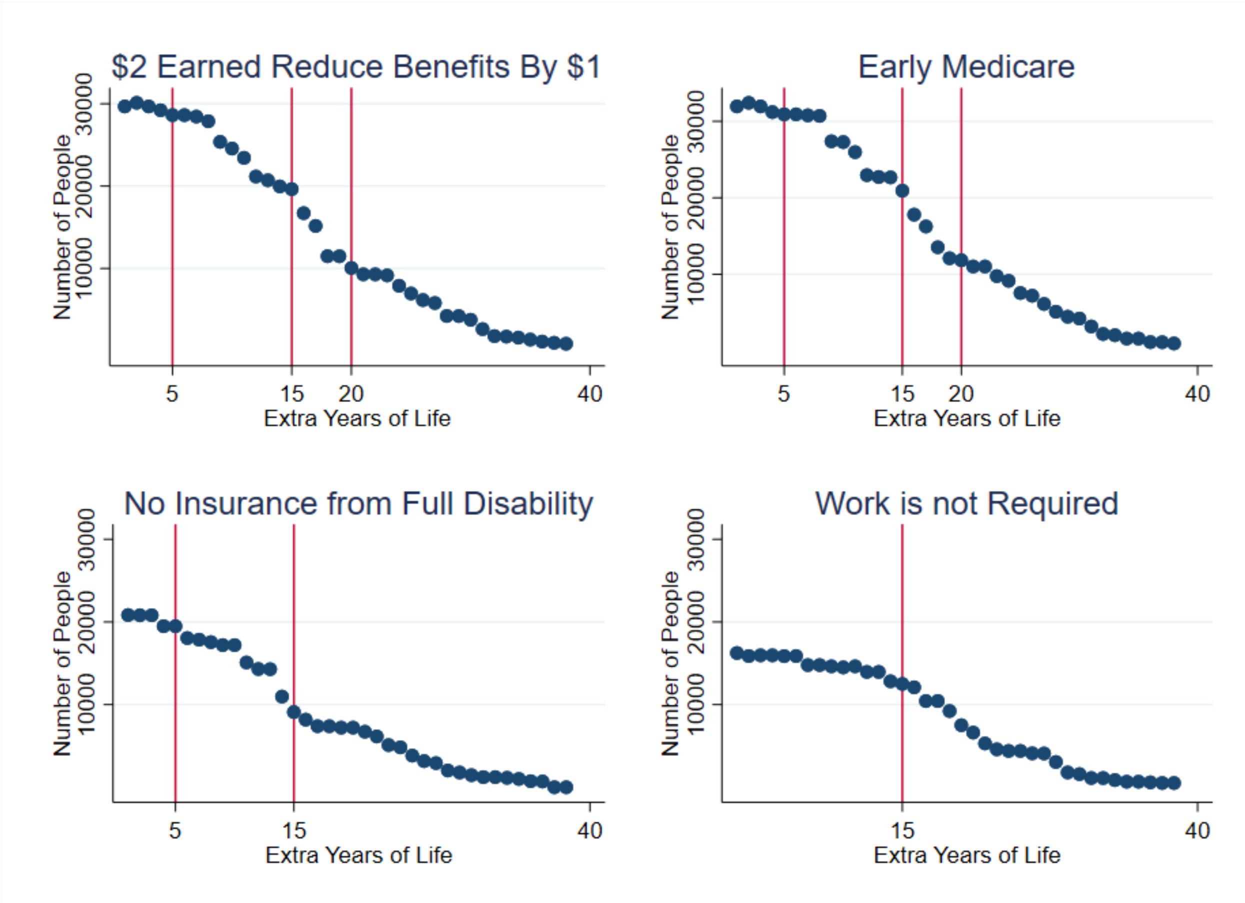
Notes: Figure 13 shows how the survival rate will change after the introduction of alternative versions of partial disability insurance (PDI) in the US. I consider the following four alternative versions of PDI reform: 1) When earnings are above the SGA amount (Substantial Gainful Activity amount was $1,130/month in 2018), benefits are reduced by $1 for each extra $2 earned (under the primary version of PDI reform, the SSDI benefits are reduced $1 for each extra $1). 2) Recipients of disability insurance for the partially disabled are provided early access to Medicare. 3) Partially disabled are not provided any financial help during the transition to full disability insurance benefits. 4) Work is not required for applicants and recipients of PDI benefits.

Figure 14 Impact of the Partial Disability Insurance Reform on The Number of Lives Saved



Notes: Figure 14 shows the number of American lives saved after the introduction of alternative versions of partial disability insurance (PDI). The numbers of lives saved are based on the changes in survival rate (see Figure 18) and the US Census estimates of the population and of its age distribution. The following four alternative versions of PDI reform are presented: 1) When earnings are above the SGA amount (Substantial Gainful Activity amount was $1,130/month in 2018), benefits are reduced by $1 for each extra $2 earned. 2) Recipients of disability insurance for the partially disabled are provided early access to Medicare. 3) Partially disabled are not provided any financial help during the transition to full disability insurance benefits. 4) Work is not required for applicants and recipients of PDI benefits.

Figure 15 Impact of the Partial Disability Insurance Reform on Life Longevity



Notes: Figure 15 shows the impact of alternative versions of partial disability insurance (PDI) reform on life longevity. The numbers of lives saved are based on the changes in survival rate (see Figure 18) and the US Census estimates of the population and of its age distribution. The following four alternative versions of PDI reform are presented: 1) When earnings are above the SGA amount (Substantial Gainful Activity amount was $1,130/month in 2018), benefits are reduced by $1 for each extra $2 earned. 2) Recipients of disability insurance for the partially disabled are provided early access to Medicare. 3) Partially disabled are not provided any financial help during the transition to full disability insurance benefits. 4) Work is not required for applicants and recipients of PDI benefits.

Tables

Table 1: Age Conditional Disability Transition Probabilities

	Not Disabled	Partially Disabled	Fully Disabled	Deceased
Not Disabled	0.861	0.087	0.048	0.005
Partially Disabled	0.275	0.529	0.183	0.012
Fully Disabled	0.177	0.313	0.492	0.018

Notes: Table 1 shows the health transition probability of a person whose current period's health is described in the first column and whose next period's health is described in the first row. HRS is biennial, and the period for this table is two years. The table is based on the RAND HRS Longitudinal File and cross-sectional HRS Public Survey Data for the years between 1994 and 2016.

Table 2: Summary Statistics

	Full Sample	Estimation Sample
	Mean	Mean
Labor Force Status, %		
Working Full-Time	38.75	39.83
by Disability Status		
Partially Disabled	17.3	17.43
Not Disabled	49.9	49.97
Working Part-Time	15.28	15.71
by Disability Status		
Partially Disabled	14.58	15.09
Not Disabled	17.56	17.92

Table 2: Summary Statistics (Continued)

	Full Sample	Estimation Sample
	Mean	Mean
Applied,%	1.29	1.42
by Disability Status		
Partially Disabled	3.66	3.63
Fully Disabled	8.47	8.54
Receive SSDI,%	6.82	6.15
Receive SSOA,%	21.16	25.24
Disability,%		
Partially Disabled	16.35	16.21
Fully Disabled	10.27	9.74
Annual Wage	52.43	52.16
Age	60.3	60.03
College	21.26	21.96
Number of Observations	147,612	121,348

Notes: Table 2 shows the summary statistics for key variables for the estimation sample and the full sample. The full sample consists of all observations available for respondents between 51 and 70, and the estimation sample described in section 4.1 is also restricted to respondents within this age range. The annual wage is in thousands of 2018 US dollars, and it is the average among non-zero wages. The table is based on the RAND HRS Longitudinal File and cross-sectional HRS Public Survey Data for the years between 1994 and 2016.

Table 3: **The Effects of Employment, Consumption, and Health Insurance on Health Statuses Transition Probabilities for The Partially Disabled**

Mortality probability		
	Average marginal effect of γ^{MJ},%	Average absolute marginal effect of ϵ_t^{MJi},%
Full-time work	-3.2519	.494
Part-time work	-2.1788	.1724
Consumption	-.003	.0032
Health insurance	-.0018	.0003
Partial disability proability		
	Average marginal effect of γ^{PJ},%	Average absolute marginal effect of ϵ_t^{PJi},%
Full-time work	-7.2787	1.6179
Part-time work	-7.4576	6.6642
Consumption	-.0074	.005
Health insurance	-.0272	.0143
Full disability probability		
	Average marginal effect of γ^{FJ},%	Average absolute marginal effect of ϵ_t^{FJi},%
Full-time work	-15.9859	.6093
Part-time work	.6166	4.7639
Consumption	-.3128	.0306
Health insurance	-.0243	.0034

Notes: Table 3 shows the average marginal effects of full-time (FT) and part-time (PT) employment, consumption (C) in tens of thousands of 2018 US dollars, and health insurance (I) on mortality (M) and partial (P) and full (F) disability rates of the partially disabled. These health effects are heterogeneous in the following way: $\beta_t^{KJi} = \gamma^{KJ} + \epsilon_t^{KJi}$, $\epsilon_t^{KJi} \overset{\text{iid}}{\sim} N(0, \sigma_{KJ}^2)$, $K \in \{M, P, F\}$, $J \in \{FT, PT, C, I\}$. The first column shows the average marginal effects of γ^{KJ}, and the second column reports the average absolute marginal effect of ϵ_t^{KJi}. The table is based on the RAND HRS Longitudinal File and cross-sectional HRS Public Survey Data for the years between 1994 and 2016.

Table 4: Cost and Benefits of Five Versions of SSDI Reform

Reform	People	Years	Cost per Year
Primary Version	29,889	553,100	$17K
$2 Earned Reduce Benefits By $1	30,297	558,960	$20K
Early Medicare	32,492	612,097	$40K
No Insurance from Full Disability	21,251	352,533	$3K
Work is not Required	15,962	330,513	$105K

Notes: Table 4 shows the costs and benefits of five versions of partial disability insurance reform in the US. Under the primary reform, the partially disabled can apply for partial disability insurance. To be eligible for partial disability insurance, the applicant must continue working, either full-time or part-time. Thus, this reform replaces incentives for partially disabled individuals to retire prematurely with the incentives to continue working. If the earnings of a partially disabled individual are higher than a certain amount of money, substantial gainful activity amount (Substantial Gainful Activity amount, as determined by SSA, was $1,130/month in 2018), then the partial DI benefits are reduced by $1 for each extra $1. A recipient of partial disability is not provided with health insurance but has insurance from the onset of full disability. If a partial disability beneficiary claims to be fully disabled, they can choose to stop working and apply for full benefits while receiving these full benefits for the period of application. If their application is approved, they continue receiving full benefits, whereas if it is not approved, they stop receiving any benefits. Like full disability insurance (DI) benefits, partial DI benefits have an age cap — full retirement age (FRA). Like existing full DI benefits, partial DI benefits are available only for those below FRA. In contrast with full DI program beneficiaries, partial DI program recipients are not automatically granted old-age benefits (OAB) upon reaching FRA and can claim OAB at an older age at their discretion. The following four alternative versions of PDI reform are presented: 1) When earnings are above the SGA amount (Substantial Gainful Activity amount was $1,130/month in 2018), benefits are reduced by $1 for each extra $2 earned. 2) Recipients of disability insurance for the partially disabled are provided early access to Medicare. 3) Partially disabled are not provided financial help during the transition to full disability insurance benefits. 4) Work is not required for applicants and recipients of PDI benefits. The numbers in column People show the number of people who will live longer lives thanks to the reform. The column Years presents the total number of life-years saved by the reform, and the column Cost per Year shows the cost of extending one person's life by one year. The table is based on the RAND HRS Longitudinal File and cross-sectional HRS Public Survey Data for the years between 1994 and 2016.

Appendix A

To determine an individual's current employment status, I use the RAND HRS Longitudinal File variables $rwlbrf$. These variables classify individuals as working full-time or part-time, unemployed, partially or fully retired, or disabled. Individuals are classified as working part-time if they are working part-time or partially retired according to $rwlbrf$, and individuals are classified as non-working if they are unemployed, fully retired, or disabled according to $rwlbrf$. SSDI application decisions are determined based on $rdstat$, and SSDI recipiency – on $rwssdi$. Individual earnings are determined based on $rwiearn$.

$rwshlt$ (self-reported health status), $rwhosp$ (hospital stay in last 2 years), $rwnrshom$ (nursing home stay in last 2 years), $rwhibpe$ (ever had high blood pressure), $rwdiabe$ (ever had diabetes), $rwcancre$ (ever had cancer), $rwlunge$ (ever had a lung disease), $rwhearte$ (ever had a heart disease), $rwstroke$ (ever had a stroke), $rwpsyche$ (ever had psychological problems), $rwarthre$ (ever had arthritis), $r1deprex$, $rwdepres$ (felt depressed), $r1efforx$, $rweffort$ (everything an effort), $r1sleepx$, $rwsleepr$ (difficulties with sleeping), $r1whappx$, $rwwhappy$ (felt happy), $r1flonex$, $rwflone$ (felt lonely), $r1fsadx$, $rwfsad$ (felt sad), $r1goingx$, $rwgoing$ (could not get going), $r1enlifex$, $rwenlife$ (enjoyed life), $rwwalkra$ (any difficulty walking across room), $rwdressa$ (any difficulty dressing), $rwbatha$ (any difficulty bathing), $rweata$ (any difficulty eating), $rwbeda$ (any difficulty getting in or out of bed), $rwwalk1a$ (any difficulty walking one block), $rwsita$ (any difficulty sitting), $rwchaira$ (any difficulty getting up from a chair), $rwdimea$ (any difficulty getting up picking up a dime), $rwarmsa$ (any difficulty extending arms up), $rwback$ (back pain) are used to construct health index.

The following RAND HRS Longitudinal File variables are used to account for demographic characteristics:

1. Age — $rwagey\_e$
2. Education — $raeduc$
3. Death year — $radyear$.

Average Index Monthly Earnings, AIME, are calculated based on administrative data from the Social Security Administration. I have limited access to administrative data on AIME and have to approximate AIME using variables from publicly available HRS data and coefficients I calculated by running the regressions of the administrative data on AIME on the following HRS variables: $rwlbrf$, $rwiearn$, $rwitot$, $hwatotw$, $rwagender$, $hwcpl$, $rwaeduc$, $rwhlthhlm$, $rwagey\_e$.

Appendix B

The model solution is similar to that of Joubert and Todd (2020). Specifically, the model is solved by backward recursion. At age t_{D-1}, an individual makes optimal work and SSDI application decisions to maximize the sum of current and future period utilities, $V_{t_{D-1}}$. The expected value of $V_{t_{D-1}}$, $EV_{t_{D-1}}$, is obtained by Monte Carlo integration, i.e., by taking draws from the shock vector distribution and averaging. 10 Monte Carlo draws for health and earnings shocks are used. These calculations are performed at a set of all possible deterministic state points. Given that it is impossible to solve the problem at all continuous values of the health index and Average Indexed Monthly Earnings (AIME), I discretize the health index into 4 grid points and AIME into 4 grid points. $EV_{t_{D-1}}$ is approximated for all other state points by a polynomial regression following an approximation method developed by Keane and Wolpin (1994, 1997). The result of this approximation is denoted as $EmaxV_{t_{D-1}}$

This procedure is repeated at age t_{D-2}. Substituting the $EmaxV_{t_{D-1}}$ for the future component $EV_{t_{D-1}}$, the optimal decision is made. Monte Carlo integration over the shock vector at t_{D-2} provides $EV_{t_{D-2}}$ for a given deterministic state point. A polynomial regression over a subset of the state points again provides an approximation to $EV_{t_{D-2}}$, denoted by $EmaxV_{t_{D-1}}$. Repeating the procedure back to the initial age provides the approximation at each age. The set of $EmaxV_t$ is the solution to the optimization problem.

Appendix C

Table A1: Parameter Estimates

Name	Symbol	Estimate
Utility of part-time leisure, constant	α_L^P	0.19
Utility of part-time leisure, health index	α_L^{PH}	0.23
Utility of full-time leisure, constant	α_L^F	0.21
Utility of full-time leisure, health index	α_L^{FH}	0.35
Utility of full-time work while partially disabled, constant	α_W^F	-0.000045
Utility of full-time work while partially disabled, health index	α_W^{FH}	-0.000104
Utility of part-time work while partially disabled, constant	α_W^P	-0.000024
Utility of part-time work while partially disabled, health index	α_W^{PH}	-0.000069
Utility of returning to full-time work, constant	α_R^F	-1.40
Utility of returning to full-time work, health index	α_R^{FH}	-47.00
Utility of returning to part-time work, constant	α_R^P	-19.40
Utility of returning to part-time work, health index	α_R^{PH}	-27.93
Utility of switching to full-time work for non-disabled	α_N^{PF}	0.00
Utility of switching to part-time work for non-disabled	α_N^{FP}	-1.50
Utility of switching to full-time work for partially disabled	α_P^{PF}	-0.00065
Utility of switching to part-time work for partially disabled	α_P^{FP}	-0.00153

Table A1: Parameter Estimates (Continued)

Name	Symbol	Estimate
Utility of applying for SSDI before SSOA recipiency for PD, constant	α_B^P	-2.18
Utility of applying for SSDI before SSOA recipiency for PD, health index	α_B^{PH}	0.00
Utility of applying for SSDI before SSOA recipiency for FD, constant	α_B^F	-0.70
Utility of applying for SSDI before SSOA recipiency for FD, health index	α_B^{FH}	-0.32
Utility of applying for SSDI during the 1st period of SSOA for PD, constant	α_F^P	0.00
Utility of applying for SSDI during the 1st period of SSOA for PD, health index	α_F^{PH}	-0.10
Utility of applying for SSDI during the 1st period of SSOA for FD, constant	α_F^F	0.00
Utility of applying for SSDI during the 1st period of SSOA for FD, health index	α_F^{FH}	-0.65
Utility of applying for SSDI during the 2nd period of SSOA for PD, constant	α_S^P	-0.22
Utility of applying for SSDI during the 2nd period of SSOA for PD, health index	α_S^{PH}	-0.31
Utility of applying for SSDI during the 2nd period of SSOA for FD, constant	α_S^F	-0.30
Utility of applying for SSDI during the 2nd period of SSOA for FD, health index	α_S^{FH}	-0.35
Utility of applying for SSDI during the 3rd period of SSOA for PD, constant	α_T^P	-0.17
Utility of applying for SSDI during the 3rd period of SSOA for PD, health index	α_T^{PH}	-0.21
Utility of applying for SSDI during the 3rd period of SSOA for FD, constant	α_T^F	-1.50
Utility of applying for SSDI during the 3rd period of SSOA for FD, health index	α_T^{FH}	-2.85

Table A1: Parameter Estimates (Continued)

Name	Symbol	Estimate
Mortality rate logit regression		
Constant	β^{MC}	-7.700000
Full-time	β^{MFT}	-0.001680
Part-time	β^{MPT}	-0.000850
Fully disabled	β^{MF}	1.482000
Partially disabled	β^{MP}	1.949254
Health Index	β^{MH}	-0.000120
Age	β^{MA}	0.044584
Education	β^{ME}	-0.079000
Full-time work for partially disabled	β^{MFP}	-2.260000
Part-time work for partially disabled	β^{MFP}	-1.513060
Full-time work for college educated	β^{MFE}	-0.000014
Part-time work for college educated	β^{MFE}	-0.000002
Consumption in thousands of dollars for non-disabled	β^{MCN}	-0.000680
Health insurance for non-disabled	β^{MIN}	-0.000315
Consumption in thousands of dollars for fully disabled	β^{MCF}	-0.000010
Health insurance for fully disabled	β^{MIF}	-0.001850
Consumption in thousands of dollars for partially disabled	β^{MCP}	-0.000296
Health insurance for partially disabled	β^{MIP}	-0.200000
Consumption in thousands of dollars for college educated	β^{MCE}	-0.000020
Health insurance for college educated	β^{MIE}	-0.013900
S.D. of full-time work effects for partially disabled	σ_{MF}	0.430000
S.D. of part-time work effects for partially disabled	σ_{MP}	0.325000
S.D. of consumption effects for partially disabled	σ_{MC}	0.000280
S.D. of health insurance effects for partially disabled	σ_{MI}	0.000170

Table A1: Parameter Estimates (Continued)

Name	Symbol	Estimate
Partial disability rate logit regression		
Constant	β^{PC}	-2.584022
Full-time	β^{PFT}	-0.788572
Part-time	β^{PPT}	-2.382821
Fully disabled	β^{PF}	0.000100
Partially disabled	β^{PP}	2.693874
Health Index	β^{PH}	-1.123749
Age	β^{PA}	0.019438
Education	β^{PE}	0.020015
Full-time work for partially disabled	β^{PFP}	-0.000440
Part-time work for partially disabled	β^{PFP}	1.574328
Full-time work for college educated	β^{PFE}	0.018344
Part-time work for college educated	β^{PFE}	-0.000094
Consumption in thousands of dollars for non-disabled	β^{PCN}	-0.000100
Health insurance for non-disabled	β^{PIN}	-0.467000
Consumption in thousands of dollars for fully disabled	β^{PCF}	-0.000075
Health insurance for fully disabled	β^{PIF}	-0.001150
Consumption in thousands of dollars for partially disabled	β^{PCP}	-0.000017
Health insurance for partially disabled	β^{PIP}	-0.003800
Consumption in thousands of dollars for college educated	β^{PCE}	-0.000017
Health insurance for college educated	β^{PIE}	-0.000455
S.D. of full-time work effects for partially disabled	σ_{PF}	0.220000
S.D. of part-time work effects for partially disabled	σ_{PP}	0.910000
S.D. of consumption effects for partially disabled	σ_{PC}	0.000096
S.D. of health insurance effects for partially disabled	σ_{PI}	0.004750

Table A1: Parameter Estimates (Continued)

Name	Symbol	Estimate
Full disability rate logit regression		
Constant	β^{FC}	-3.101202
Full-time	β^{FFT}	-3.755109
Part-time	β^{FPT}	0.140000
Fully disabled	β^{FF}	3.885498
Partially disabled	β^{FP}	0.000160
Health Index	β^{FH}	-0.417167
Age	β^{FA}	0.008440
Education	β^{FE}	-1.700000
Full-time work for partially disabled	β^{FFP}	-0.001151
Part-time work for partially disabled	β^{FFP}	0.006880
Full-time work for college educated	β^{FFE}	0.171613
Part-time work for college educated	β^{FFE}	-0.000760
Consumption in thousands of dollars for non-disabled	β^{FCN}	-0.000002
Health insurance for non-disabled	β^{FIN}	-0.376300
Consumption in thousands of dollars for fully disabled	β^{FCF}	-0.000920
Health insurance for fully disabled	β^{FIF}	-0.000430
Consumption in thousands of dollars for partially disabled	β^{FCP}	-0.005550
Health insurance for partially disabled	β^{FIP}	-0.002000
Consumption in thousands of dollars for college educated	β^{FCE}	-0.001700
Health insurance for college educated	β^{FIE}	-0.001040
S.D. of full-time work effects for partially disabled	σ_{FF}	0.065000
S.D. of part-time work effects for partially disabled	σ_{FP}	1.390000
S.D. of consumption effects for partially disabled	σ_{FC}	0.002020
S.D. of health insurance effects for partially disabled	σ_{FI}	0.000400

Table A1: Parameter Estimates (Continued)

Name	Symbol	Estimate
Health index regression		
Constant	β^{FC}	0.2045000
Full-time	β^{FFT}	-.0465000
Part-time	β^{FPT}	0.0000000
Fully disabled	β^{FF}	-.7100000
Partially disabled	β^{FP}	-.4000000
Health Index	β^{FH}	0.7700000
Age	β^{FA}	-.0010700
Education	β^{FE}	0.1423800
Full-time work for partially disabled	β^{FFP}	-.0044000
Part-time work for partially disabled	β^{FFP}	-.0389900
Full-time work for college educated	β^{FFE}	0.0000280
Part-time work for college educated	β^{FFE}	-.4008460
Consumption in thousands of dollars for non-disabled	β^{FCN}	0.0000007
Health insurance for non-disabled	β^{FIN}	0.0108000
Consumption in thousands of dollars for fully disabled	β^{FCF}	0.0000010
Health insurance for fully disabled	β^{FIF}	0.2850890
Consumption in thousands of dollars for partially disabled	β^{FCP}	0.0000068
Health insurance for partially disabled	β^{FIP}	0.0000001
Consumption in thousands of dollars for college educated	β^{FCE}	0.0000185
Health insurance for college educated	β^{FIE}	0.0875000
S.D. of full-time work effects for partially disabled	σ^{HF}	0.010500
S.D. of part-time work effects for partially disabled	σ^{HP}	0.036000
S.D. of consumption effects for partially disabled	β^{HC}	0.000012
S.D. of health insurance effects for partially disabled	β^{HI}	0.002800

Table A1: Parameter Estimates (Continued)

Name	Symbol	Estimate
SSDI award probability logit regression		
Constant	β_R^C	-10.00000
Fully disabled	β_R^F	0.00
Health Index	β_R^H	-9.03
Education	β_R^E	0.00
Age $\geq$ 59	$\beta_R^{Age_{59}}$	0.80
Age $\geq$ 60	$\beta_R^{Age_{60}}$	0.48
Age $\geq$ 61	$\beta_R^{Age_{61}}$	1.45
Age $\geq$ 62	$\beta_R^{Age_{62}}$	0.14
Age $\geq$ 63	$\beta_R^{Age_{63}}$	0.00
Age $\geq$ 64	$\beta_R^{Age_{64}}$	0.00
Earnings regression		
Constant	β_W^C	10.54443
Full-time	β_W^F	61.75616
Health Index	β_W^H	0.09900
Age	β_W^A	-0.57952
Education	β_W^E	35.19842
Full-time work for partially disabled	β_W^{FP}	-16.63145
Part-time work for partially disabled	β_W^{PP}	-0.45945
Full-time work for college educated	β_W^{FE}	33.43448
Part-time work for college educated	β_W^{PE}	0.20500

Table A1: Parameter Estimates (Continued)

Name	Symbol	Estimate
Private health insurance logit regression		
Constant	β_{PH}	-2.62
Full-time	β_{PH}^{FT}	2.50
Part-time	β_{PH}^{PT}	1.27
Fully disabled	β_{PH}^{F}	-0.45
Partially disabled	β_{PH}^{P}	0.48
Health Index	β_{PH}^{H}	0.09
Age	β_{PH}^{A}	0.03
Education	β_{PH}^{E}	0.80
Full-time work for partially disabled	β_{PH}^{FP}	-1.20
Part-time work for partially disabled	β_{PH}^{PP}	-1.13
Full-time work for college educated	β_{PH}^{FE}	0.38
Part-time work for college educated	β_{PH}^{PE}	0.00
Medicaid logit regression		
Constant	β_{MC}^{C}	-4.40000
Health Index	β_{MC}^{H}	-0.00017
Age	β_{MC}^{A}	0.03600
Education	β_{MC}^{E}	-2.23000
Consumption	β_{MC}^{C}	0.00001

Table A1: Parameter Estimates (Continued)

Name	Symbol	Estimate
First period utility adjustment for full-time work while partially disabled	$\alpha_{FDt_{min}}$	-1.684867
First period utility adjustment for part-time work while partially disabled	$\alpha_{PDt_{min}}$	-0.912
First period utility adjustment for SSDI applications for partially	$\alpha_{At_{min}}$	-1.42
First period utility adjustment for SSDI applications for fully disabled	$\alpha_{AFt_{min}}$	-0.13
Bequest utility of working full-time at 70	α_{FTb}	2.00
Bequest utility of working part-time at 70	α_{FTb}	4.00
Bequest utility of working full-time at 70 for partially disabled	α_{FTb}	1.075
Bequest utility of working part-time at 70 for partially disabled	α_{FTb}	0.9821
Bequest utility of not receiving SSOA benefits before 70	α_{OAb}	-7.70
Bequest utility of not receiving SSOA benefits before 70 for partially disabled	α_{OAPb}	-0.149
Bequest utility of not receiving SSOA benefits before 70 for fully disabled	α_{OAFb}	0.00
Bequest utility of not starting SSOA benefits at 70	$\alpha_{A_{OAb}}$	1.582
Bequest utility of not starting SSOA benefits at 70 for partially disabled	$\alpha_{A_{OAPb}}$	1.4492542
Bequest utility of not starting SSOA benefits at 70 for fully disabled	$\alpha_{A_{OAFb}}$	-0.002
Mortality rate logit regression, quadratic age coefficient when age $\geq$ 70	$\beta_{MA_{squared}}$	0.000985
Terminal value	$\alpha_{terminal}$	-0.239
Earnings shock	σ^2_W	400.00
Health index shock	σ^2_H	0.00052

Notes: Table A1 shows the model parameter estimates. In total, my model has 197 parameters described in the section 5. Consumption is in thousands of 2018 US dollars. These parameters are estimated using the simulated method of moments based on the RAND HRS Longitudinal File and HRS Public Survey Data for 1994 – 2016. Age dummies in SSDI award logit regression represent a higher probability award after an applicant reaches a certain age. SSA has special rules for applicants approaching retirement age (age 60 and above).

Table A2: List of Moments

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Full-time	51		-	-				0.689	0.743	0.214
Full-time	52		-	-				0.683	0.740	0.217
Full-time	53		-	-				0.694	0.731	0.212
Full-time	54		-	-				0.680	0.740	0.217
Full-time	55		-	-				0.687	0.750	0.215
Full-time	56		-	-				0.664	0.733	0.223
Full-time	57		-	-				0.649	0.707	0.228
Full-time	58		-	-				0.634	0.704	0.232
Full-time	59		-	-				0.601	0.683	0.240
Full-time	60		-	-				0.554	0.650	0.247
Full-time	61		-	-				0.524	0.589	0.249
Full-time	62		-	-				0.420	0.404	0.244
Full-time	63		-	-				0.357	0.319	0.230
Full-time	64		-	-				0.330	0.239	0.221
Full-time	65		-	-				0.255	0.174	0.190
Full-time	66		-	-				0.223	0.167	0.173
Full-time	67		-	-				0.194	0.162	0.156
Full-time	68		-	-				0.149	0.167	0.127
Full-time	69		-	-				0.138	0.104	0.119
Full-time	70		-	-				0.123	0.129	0.108

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Full-time	51		+	-				0.247	0.319	0.186
Full-time	52		+	-				0.312	0.325	0.215
Full-time	53		+	-				0.327	0.338	0.220
Full-time	54		+	-				0.354	0.341	0.229
Full-time	55		+	-				0.328	0.325	0.221
Full-time	56		+	-				0.340	0.298	0.225
Full-time	57		+	-				0.263	0.284	0.194
Full-time	58		+	-				0.297	0.286	0.209
Full-time	59		+	-				0.264	0.266	0.195
Full-time	60		+	-				0.222	0.242	0.173
Full-time	61		+	-				0.201	0.217	0.161
Full-time	62		+	-				0.163	0.171	0.137
Full-time	63		+	-				0.130	0.137	0.113
Full-time	64		+	-				0.104	0.107	0.093
Full-time	65		+	-				0.082	0.070	0.076
Full-time	66		+	-				0.062	0.054	0.058
Full-time	67–68		+	-				0.048	0.044	0.046
Full-time	69		+	-				0.034	0.030	0.032
Full-time	70		+	-				0.040	0.031	0.038

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Part-time	51–52		-	-				0.152	0.229	0.129
Part-time	53		-	-				0.148	0.219	0.126
Part-time	54		-	-				0.153	0.205	0.130
Part-time	55		-	-				0.148	0.192	0.126
Part-time	56		-	-				0.153	0.197	0.130
Part-time	57		-	-				0.163	0.203	0.136
Part-time	58		-	-				0.160	0.180	0.135
Part-time	59		-	-				0.174	0.177	0.144
Part-time	60		-	-				0.176	0.174	0.145
Part-time	61		-	-				0.179	0.171	0.147
Part-time	62		-	-				0.196	0.167	0.158
Part-time	63		-	-				0.218	0.165	0.171
Part-time	64		-	-				0.202	0.180	0.161
Part-time	65		-	-				0.217	0.192	0.170
Part-time	66		-	-				0.213	0.197	0.167
Part-time	67		-	-				0.225	0.214	0.174
Part-time	68		-	-				0.222	0.232	0.173
Part-time	69		-	-				0.212	0.309	0.167
Part-time	70		-	-				0.207	0.230	0.164

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Part-time	51		+	-				0.208	0.236	0.165
Part-time	52		+	-				0.214	0.247	0.168
Part-time	53		+	-				0.196	0.211	0.158
Part-time	54		+	-				0.191	0.198	0.155
Part-time	55		+	-				0.216	0.194	0.170
Part-time	56		+	-				0.182	0.200	0.149
Part-time	57		+	-				0.167	0.205	0.139
Part-time	58		+	-				0.186	0.183	0.152
Part-time	59		+	-				0.151	0.177	0.128
Part-time	60		+	-				0.177	0.181	0.146
Part-time	61		+	-				0.161	0.187	0.135
Part-time	62		+	-				0.143	0.174	0.122
Part-time	63		+	-				0.145	0.145	0.124
Part-time	64		+	-				0.146	0.124	0.124
Part-time	65		+	-				0.131	0.118	0.114
Part-time	66		+	-				0.129	0.104	0.112
Part-time	67–68		+	-				0.110	0.097	0.098
Part-time	69		+	-				0.106	0.100	0.095
Part-time	70		+	-				0.092	0.114	0.084

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Applied for SSDI	51		+	-				0.029	0.031	0.028
Applied for SSDI	52		+	-				0.030	0.037	0.029
Applied for SSDI	53		+	-				0.036	0.041	0.035
Applied for SSDI	54		+	-				0.038	0.035	0.036
Applied for SSDI	55		+	-				0.027	0.038	0.026
Applied for SSDI	56		+	-				0.036	0.024	0.035
Applied for SSDI	57		+	-				0.033	0.025	0.032
Applied for SSDI	58		+	-				0.031	0.027	0.030
Applied for SSDI	59		+	-				0.032	0.036	0.031
Applied for SSDI	60		+	-				0.039	0.029	0.038
Applied for SSDI	61		+	-				0.037	0.023	0.036
Applied for SSDI	62		+	-				0.056	0.056	0.053
Applied for SSDI	63		+	-				0.037	0.042	0.036
Applied for SSDI	64		+	-				0.036	0.047	0.035

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Applied for SSDI	51		-	+				0.110	0.106	0.098
Applied for SSDI	52		-	+				0.110	0.110	0.098
Applied for SSDI	53		-	+				0.103	0.093	0.093
Applied for SSDI	54		-	+				0.101	0.073	0.091
Applied for SSDI	55		-	+				0.102	0.083	0.092
Applied for SSDI	56		-	+				0.092	0.081	0.083
Applied for SSDI	57		-	+				0.091	0.083	0.083
Applied for SSDI	58		-	+				0.089	0.073	0.081
Applied for SSDI	59		-	+				0.108	0.100	0.096
Applied for SSDI	60		-	+				0.091	0.095	0.083
Applied for SSDI	61		-	+				0.087	0.084	0.079
Applied for SSDI	62		-	+				0.055	0.050	0.052
Applied for SSDI	63		-	+				0.069	0.065	0.065
Applied for SSDI	64		-	+				0.070	0.076	0.066

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Receive SSOA	62							0.287	0.230	0.205
Receive SSOA	63							0.375	0.398	0.234
Receive SSOA	64							0.439	0.489	0.246
Receive SSOA	65							0.656	0.652	0.226
Receive SSOA	66							0.841	0.793	0.133
Receive SSOA	67							0.868	0.829	0.115
Receive SSOA	68							0.884	0.844	0.103
Receive SSOA	69							0.889	0.847	0.099
Receive SSOA	70							0.907	0.880	0.084

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Receive SSDI	51							0.051	0.051	0.051
Receive SSDI	52							0.056	0.055	0.051
Receive SSDI	53							0.060	0.065	0.058
Receive SSDI	54							0.063	0.070	0.058
Receive SSDI	55							0.070	0.076	0.065
Receive SSDI	56							0.077	0.082	0.071
Receive SSDI	57							0.073	0.085	0.068
Receive SSDI	58							0.077	0.087	0.071
Receive SSDI	59							0.078	0.090	0.072
Receive SSDI	60							0.081	0.096	0.075
Receive SSDI	61							0.089	0.099	0.081
Receive SSDI	62							0.096	0.105	0.087
Receive SSDI	63							0.097	0.113	0.087
Receive SSDI	64							0.100	0.121	0.090
Receive SSDI	<65		-	+				0.544	0.627	0.248
Receive SSDI	<65				-			0.091	0.108	0.083
Receive SSDI	<65				-			0.028	0.025	0.027

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Part. D.	51							0.092	0.095	0.083
Part. D.	52							0.104	0.104	0.093
Part. D.	53							0.103	0.104	0.092
Part. D.	54							0.110	0.112	0.098
Part. D.	55							0.112	0.117	0.099
Part. D.	56							0.119	0.116	0.105
Part. D.	57							0.114	0.120	0.101
Part. D.	58							0.123	0.120	0.108
Part. D.	59							0.121	0.125	0.107
Part. D.	60							0.131	0.127	0.114
Part. D.	61							0.132	0.128	0.114
Part. D.	62							0.142	0.122	0.122
Part. D.	63							0.131	0.113	0.114
Part. D.	64							0.138	0.127	0.119
Part. D.	<65	-	-	-				0.149	0.190	0.127
Part. D.	<65	PT	-	-				0.091	0.033	0.083
Part. D.	<65	FT	-	-				0.067	0.067	0.063
Part. D.	<65	-	+	-				0.521	0.647	0.250
Part. D.	<65	PT	+	-				0.530	0.431	0.249
Part. D.	<65	FT	+	-				0.422	0.519	0.244

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Part. D.	<65	-			-			0.234	0.296	0.179
Part. D.	<65	PT			-			0.158	0.125	0.133
Part. D.	<65	FT			-			0.100	0.105	0.090
Part. D.	<65	-			+			0.180	0.209	0.148
Part. D.	<65	PT			+			0.115	0.054	0.102
Part. D.	<65	FT			+			0.062	0.067	0.058
Part. D.	<65		-	-		<20		0.127	0.126	0.111
Part. D.	<65		-	-		20–40		0.095	0.066	0.086
Part. D.	<65		-	-		40–60		0.083	0.067	0.076
Part. D.	<65		-	-		>60		0.062	0.054	0.058
Part. D.	<65		+	-		<20		0.544	0.612	0.248
Part. D.	<65		+	-		>20		0.475	0.531	0.249
Part. D.	<65		-	+		<10		0.187	0.143	0.152
Part. D.	<65		-	+		>10		0.198	0.158	0.159
Part. D.	<65				-	<20		0.197	0.249	0.158
Part. D.	<65				-	20–40		0.126	0.121	0.110
Part. D.	<65				-	40–60		0.114	0.103	0.101
Part. D.	<65				-	>60		0.089	0.081	0.081
Part. D.	<65				+	<40		0.146	0.101	0.125
Part. D.	<65				+	40–60		0.090	0.064	0.082
Part. D.	<65				+	>60		0.058	0.064	0.054

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Part. D.	<65		-	-			-	0.117	0.105	0.103
Part. D.	<65		-	-			+	0.077	0.063	0.071
Part. D.	<65		+	-			-	0.460	0.556	0.249
Part. D.	<65		+	-			+	0.499	0.526	0.250
Part. D.	<65		-	+			-	0.187	0.153	0.152
Part. D.	<65		-	+			+	0.146	0.149	0.125
Part. D.	<65				-		-	0.185	0.207	0.151
Part. D.	<65				-		+	0.131	0.120	0.114
Part. D.	<65				+		-	0.149	0.088	0.127
Part. D.	<65				+		+	0.083	0.060	0.076

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Fully D.	51							0.029	0.028	0.028
Fully D.	52							0.041	0.038	0.039
Fully D.	53							0.040	0.039	0.039
Fully D.	54							0.045	0.041	0.043
Fully D.	55							0.046	0.045	0.043
Fully D.	56							0.044	0.043	0.042
Fully D.	57							0.043	0.043	0.041
Fully D.	58							0.043	0.047	0.041
Fully D.	59							0.047	0.048	0.045
Fully D.	60							0.044	0.050	0.042
Fully D.	61							0.048	0.051	0.046
Fully D.	62							0.044	0.038	0.042
Fully D.	<65	-	-	-				0.143	0.067	0.123
Fully D.	<65	PT	-	-				0.014	0.024	0.014
Fully D.	<65	FT	-	-				0.011	0.009	0.011
Fully D.	<65	-	+	-				0.185	0.132	0.151
Fully D.	<65	PT	+	-				0.094	0.113	0.085
Fully D.	<65	FT	+	-				0.059	0.035	0.055

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Fully D.	<65	-			-			0.172	0.203	0.143
Fully D.	<65	PT			-			0.029	0.068	0.028
Fully D.	<65	FT			-			0.018	0.013	0.018
Fully D.	<65	-			+			0.053	0.075	0.050
Fully D.	<65	PT			+			0.010	0.007	0.010
Fully D.	<65	FT			+			0.004	0.002	0.004
Fully D.	<65		-	-		<20		0.027	0.055	0.026
Fully D.	<65		-	-		20–40		0.018	0.019	0.017
Fully D.	<65		-	-		40–60		0.013	0.015	0.013
Fully D.	<65		-	-		>60		0.006	0.008	0.006
Fully D.	<65		+	-		<20		0.175	0.158	0.145
Fully D.	<65		+	-		>20		0.099	0.055	0.089
Fully D.	<65		-	+		<10		0.726	0.722	0.199
Fully D.	<65		-	+		>10		0.724	0.735	0.200
Fully D.	<65				-	<10		0.210	0.237	0.166
Fully D.	<65				-	>10		0.095	0.064	0.086
Fully D.	<65				+	<10		0.061	0.048	0.057
Fully D.	<65				+	>10		0.031	0.007	0.030

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Fully D.	<65		-	-			-	0.045	0.035	0.043
Fully D.	<65		-	-			+	0.010	0.012	0.009
Fully D.	<65		+	-			-	0.220	0.108	0.172
Fully D.	<65		+	-			+	0.077	0.073	0.071
Fully D.	<65		-	+			-	0.746	0.787	0.190
Fully D.	<65		-	+			+	0.791	0.781	0.166
Fully D.	<65				-		-	0.156	0.120	0.132
Fully D.	<65				-		+	0.030	0.031	0.029
Fully D.	<65				+		-	0.065	0.010	0.061
Fully D.	<65				+		+	0.008	0.004	0.008

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Earnings	<70	PT	-	-				55.271	52.199	2874.733
Earnings	<70	FT	-	-				22.441	25.376	1415.730
Earnings	<70	PT	+	-				39.992	42.727	1466.460
Earnings	<70	FT	+	-				13.738	12.174	692.081
Earnings	<70	PT			+			81.599	89.189	4916.676
Earnings	<70	FT			+			32.705	30.202	2840.227
Earnings	51–55	FT			+			50.322	46.023	2701.694
Earnings	56–61	FT			+			47.066	43.223	2595.686
Earnings	62–66	FT			+			38.077	42.870	2431.970
Earnings	67–70	FT			+			26.425	33.256	1949.899

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Mortality	51–52							0.007	0.005	0.007
Mortality	53–54							0.008	0.007	0.008
Mortality	55							0.009	0.008	0.008
Mortality	56							0.009	0.010	0.009
Mortality	57							0.010	0.009	0.010
Mortality	58							0.012	0.011	0.012
Mortality	59							0.013	0.010	0.013
Mortality	60							0.015	0.013	0.015
Mortality	61							0.013	0.013	0.013
Mortality	62							0.014	0.013	0.014
Mortality	63							0.015	0.016	0.015
Mortality	64							0.016	0.017	0.016
Mortality	65							0.020	0.022	0.020
Mortality	66							0.022	0.023	0.021
Mortality	67–68							0.023	0.025	0.022
Mortality	69–70							0.026	0.030	0.025

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Mortality	71							0.036	0.036	0.035
Mortality	72							0.046	0.040	0.043
Mortality	73							0.045	0.045	0.043
Mortality	74							0.046	0.048	0.044
Mortality	75							0.057	0.054	0.054
Mortality	76							0.058	0.060	0.054
Mortality	77							0.063	0.062	0.059
Mortality	78							0.067	0.064	0.062
Mortality	79							0.074	0.079	0.068
Mortality	80							0.083	0.083	0.076
Mortality	81							0.088	0.089	0.080
Mortality	82							0.101	0.094	0.091
Mortality	83							0.110	0.111	0.098
Mortality	84							0.118	0.127	0.104
Mortality	85							0.133	0.138	0.115
Mortality	86							0.147	0.150	0.126
Mortality	87							0.170	0.155	0.141
Mortality	88							0.175	0.163	0.145
Mortality	89							0.213	0.247	0.168
Mortality	90							0.192	0.194	0.155

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Mortality	<70		-	-				0.007	0.006	0.007
Mortality	<70		-	+				0.043	0.034	0.041
Mortality	<70	-			-			0.026	0.027	0.025
Mortality	<70	-			+			0.018	0.021	0.017
Mortality	<70	FT			-			0.006	0.006	0.006
Mortality	<70	PT			-			0.007	0.007	0.007
Mortality	<70	-	-	-				0.012	0.008	0.012
Mortality	<70	-	+	-				0.035	0.053	0.034
Mortality	<70	FT	+	-				0.015	0.005	0.015
Mortality	<70	PT	+	-				0.011	0.010	0.011
Mortality	<70		-	-		<20		0.010	0.007	0.009
Mortality	<70		-	-		20–40		0.007	0.006	0.007
Mortality	<70		-	-		40–60		0.005	0.005	0.005
Mortality	<70		-	-		>60		0.004	0.006	0.004
Mortality	<70		+	-		<20		0.030	0.045	0.029
Mortality	<70		+	-		>20		0.024	0.019	0.024
Mortality	<70		-	+		<10		0.045	0.029	0.043
Mortality	<70		-	+		>10		0.047	0.037	0.044

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Mortality	<70				-	<20		0.020	0.023	0.020
Mortality	<70				-	20–40		0.012	0.010	0.012
Mortality	<70				-	>40		0.007	0.006	0.007
Mortality	<70				+	<40		0.012	0.010	0.012
Mortality	<70				+	40–60		0.005	0.005	0.005
Mortality	<70				+	>60		0.004	0.005	0.004
Mortality	<65		-	-			-	0.009	0.006	0.009
Mortality	<65		-	-			+	0.005	0.005	0.005
Mortality	<65		+	-			-	0.028	0.030	0.027
Mortality	<65		+	-			+	0.018	0.021	0.018
Mortality	<65		-	+			-	0.024	0.030	0.024
Mortality	<65		-	+			+	0.023	0.031	0.024
Mortality	<65				-		-	0.022	0.017	0.022
Mortality	<65				-		+	0.008	0.010	0.008
Mortality	<65				+		-	0.015	0.009	0.015
Mortality	<65				+		+	0.005	0.006	0.005

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Health Index	51–55							0.140	0.113	1.011
Health Index	56–61							0.080	0.105	1.049
Health Index	62–66							0.066	0.070	0.965
Health Index	67–70							0.036	-0.168	0.892
Health Index	<70	-	-	-				0.316	0.272	0.586
Health Index	<70	FT	-	-				0.453	0.468	0.467
Health Index	<70	PT	-	-				0.412	0.370	0.486
Health Index	<70	-	+	-				-0.639	-0.583	1.081
Health Index	<70	FT	+	-				-0.403	-0.239	0.936
Health Index	<70	PT	+	-				-0.464	-0.486	0.949
Health Index	<70		-	+				-1.321	-1.094	1.292
Health Index	<70	FT			+			0.612	0.668	0.347
Health Index	<70	PT			+			0.530	0.352	0.422
Health Index	<70		-	-		<20		0.327	0.290	0.582
Health Index	<70		-	-		20–40		0.344	0.389	0.534
Health Index	<70		-	-		40–60		0.439	0.415	0.438
Health Index	<70		-	-		>60		0.604	0.599	0.319
Health Index	<70		+	-		<20		-0.630	-0.547	1.082
Health Index	<70		+	-		>20		-0.376	-0.139	0.878
Health Index	<70		-	+		<10		-1.460	-1.184	1.268
Health Index	<70		-	+		>10		-1.243	-0.937	1.266

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Health Index	<70				-	<20		-0.215	-0.278	1.240
Health Index	<70				-	20–40		0.145	0.191	0.770
Health Index	<70				-	40–60		0.314	0.313	0.552
Health Index	<70				-	>60		0.468	0.343	0.445
Health Index	<70				+	<40		0.376	0.353	0.692
Health Index	<70				+	40–60		0.525	0.441	0.450
Health Index	<70				+	>60		0.651	0.653	0.311
Health Index	<65		-	-			-	0.124	0.287	0.801
Health Index	<65		-	-			+	0.480	0.468	0.446
Health Index	<65		+	-			-	-0.909	-0.733	1.218
Health Index	<65		+	-			+	-0.405	-0.427	0.948
Health Index	<65		-	+			-	-1.382	-1.461	1.285
Health Index	<65		-	+			+	-1.275	-1.503	1.241
Health Index	<65				-		-	-0.528	-0.342	1.480
Health Index	<65				-		+	0.226	0.178	0.756
Health Index	<65				+		-	0.006	0.342	1.290
Health Index	<65				+		+	0.582	0.630	0.420

Table A2: List of Moments (Continued)

Outcome	Conditions							Mean		Variance
	Age	LFP	PD	FD	Educ.	Cons.	HI	Data	Simulated	
Private HI	<70	FT	-	-				0.866	0.894	0.116
Private HI	<70	PT	-	-				0.708	0.759	0.207
Private HI	<70	FT	+	-				0.787	0.804	0.168
Private HI	<70	PT	+	-				0.587	0.553	0.243
Private HI	<70	FT			-			0.835	0.864	0.138
Private HI	<70	PT			-			0.646	0.623	0.229
Private HI	<70	FT			+			0.924	0.956	0.070
Private HI	<70	PT			+			0.818	0.807	0.149
Private HI	51–55							0.728	0.731	0.198
Private HI	56–60							0.728	0.718	0.198
Private HI	61–64							0.722	0.611	0.201
Private HI	<70		-	-				0.768	0.726	0.178
Private HI	<70		+	-				0.582	0.565	0.243
Private HI	<70		-	+				0.274	0.280	0.199
Private HI	<70				-			0.644	0.590	0.229
Private HI	<70				+			0.851	0.854	0.127
Medicaid	51–55							0.074	0.063	0.069
Medicaid	56–60							0.076	0.072	0.070
Medicaid	61–64							0.075	0.084	0.069
Medicaid	<70				-			0.093	0.101	0.084
Medicaid	<70				+			0.017	0.012	0.016

Notes: Table A2 shows the list of moments utilized in the simulated method of moments. All moments are conditional means calculated for the HRS data and simulated data. The table's columns are as follows: 1.) The Outcome column describes the variables for which the means are computed. Full-time stands for working full-time, Part-time — working part-time, Applied for SSDI — applying for SSDI benefits, Receive SSOA — receiving SSOA benefits, Receive SSDI — receiving SSDI benefits, Part. D. — probability of being partially disabled, Fully D. — probability of being fully disabled, Mortality — the probability of dying, Private HI — the probability of being covered by private health insurance, and Medicaid — the probability of being covered by Medicaid. In the model, individuals make labor supply decisions when they are between 51 and 70, they can apply for SSDI benefits when they are younger than 65, and they can apply for Social Security Old-age benefits when they are between 62 and 70. The massive retirement process that starts when individuals turn 62 affects their answers to questions about disability. As a result, I focus on the shares of disabled people below 62. 2.) Conditions columns list the variables on which the means are conditional. All non-age conditions are calculated based on lagged variables. "-" in the Conditions columns LFP, PD, FD, Educ., and HI stand for conditional on not working, being not partially disabled, being not fully disabled, not having a college education, and not having health insurance. "+" in the columns PD, FD, Educ., and HI stand for conditional on being partially disabled, being fully disabled, being college educated, and being covered by health insurance. Cons. is the consumption in thousands of 2018 US dollars. Consumption is the sum of earnings, SSDI, and Social Security Old Age benefits. 3.) Mean columns show the means for the HRS data (Data column) and the simulated data (Simulated column). 4.) The Variance column shows the variance of the means computed using HRS data. The inversed variance is used for the moment weights.