

All or Nothing: Health and the U.S. Social Security Disability Insurance

Ivan Suvorov

UNC-Chapel Hill

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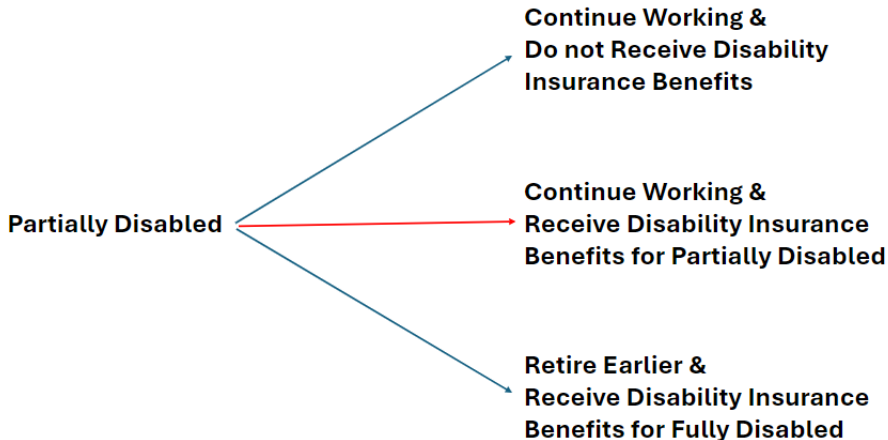
Public Disability Insurance Program in the US

- One of the most fundamental questions in health and public economics is how income from government programs influences beneficiaries' health
- The Social Security Disability Insurance (SSDI) program is the main disability insurance program for disabled individuals in the US
- 10M Americans receive SSDI benefits at a cost of \$12B/month
- The most recent reform of SSDI was introduced in 1999

Public Disability Insurance Program in the US

- SSDI eligibility criteria treat health as a binary outcome:
a person is either considered to be fully disabled or not disabled
- This dichotomy incentivizes applicants to exaggerate or even exacerbate their health problems and leave the labor force prematurely
 - Around 20% of SSDI beneficiaries have some capability to return to work — they are not fully disabled.
 - Less than 1% of SSDI recipients return to the labor force

Public Disability Insurance Program in Other Countries



Disability Insurance Program for the Partially Disabled

The extension of the SSDI program to the partially disabled will affect health through three main channels:

- Income (additional SSDI benefits)
- Labor supply (reservation wage changes)
- Health insurance coverage (employer-sponsored and early Medicare)

Research Question

. How will the extension of disability insurance to the individuals with the partial disability impact the longevity and disability propensity of the nearly elderly and the elderly?

Preview of the Results

The introduction of partial disability insurance (DI) in the US will

- Increase labor supply of partially disabled individuals:
2M join the labor force and increase their earnings by a total of \$40B
- Decrease the number of disabled Americans by around 1%
- Increase the life span of $\sim 30,000$ people by 5 years, extend lives of $\sim 20,000$ by 15 years, and raise life longevity of $\sim 10,000$ by 20 years
- Cost of extending the life of one person by one year is \$17K

Americans with Disabilities

- The SSDI program does not cover all existing demand for disability insurance
- The majority of SSDI applications are not approved
- Out-of-pocket medical costs are 2 times higher for Americans with disabilities (Kennedy et al., 2017)
- Earnings of employed partially disabled are almost 2 times lower than earnings of employed non-disabled

Americans with Disabilities

Table: 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. The table shows the age-conditional 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 Health and Retirement Study (HRS) Data.

Americans with Disabilities

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Literature on Disability Insurance

Empirical approach	Focus on effects of disability insurance on Health Labor supply	
Reduced form models	Borsch-Supan et al. (2017) Black et al. (2021) Gelber et al. (2023)	Gilleskie & Hoffman (2014)
Individual decision-making models that permit the prediction of effects of modifications of SSDI design	This paper	Yin (2015)

Literature on Disability Insurance

The effects of disability insurance on health

According to Gelber et al. (2023), "evidence on the overall impact of DI receipt on mortality — which reflects the combined effects of changes in income, work activity, and health insurance — is limited to a study by Black et al. (2021)"

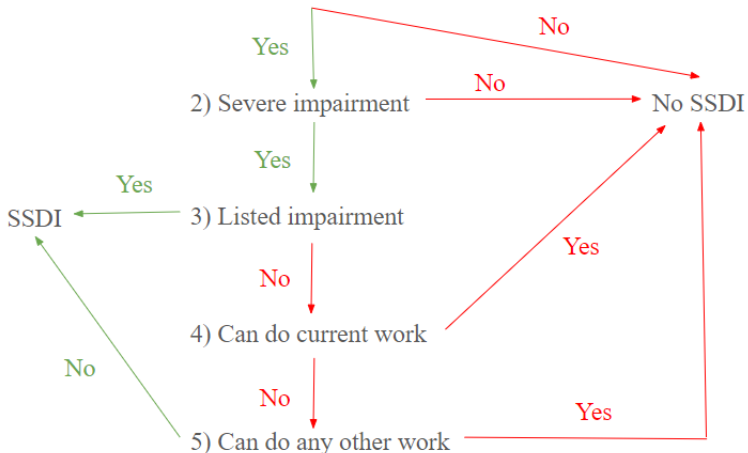
- Black et al. (2021) show that individuals who are more unhealthy benefit from the DI award, while those who are more healthy experience reductions in health with DI
- Gelber et al. (2023) estimate that an additional \$1,000 in disability insurance payments/person can save 830–1,340 lives annually, i.e., ~ \$10 M/life

Literature on Retirement

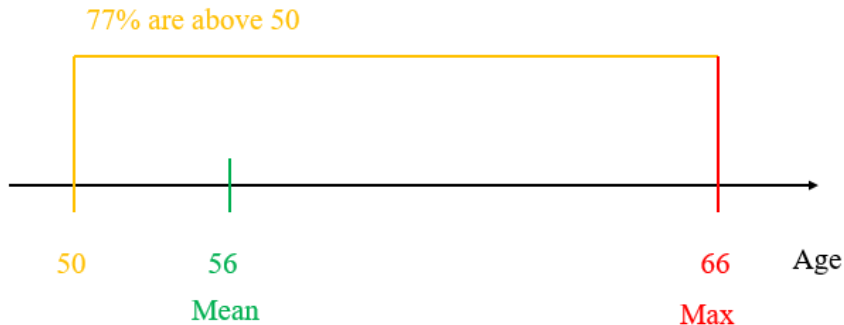
- Under the public disability insurance program for the partially disabled, partially disabled Americans will choose to retire at an older age (see Yin, 2015)
- With 10% higher Social Security benefits, people are 5% more likely to retire and 5% more likely to die in the next five years (see Snyder and Evans, 2006)
- In the month when Americans become eligible for Social Security Old Age, their mortality rate increases by 1.5% (see Fitzpatrick and Moore, 2018)
- Men retiring one year earlier live 2.2 months less (Kuhn et al., 2020)

5 Steps to Receive SSDI

- 1) Earn less than Substantial Gainful Activity (\$1,130/month in 2021)



Age Distribution of SSDI Beneficiaries



Data and Sample Design

Two sources of the data:

- 1 Health and Retirement Study (HRS) Public Survey Data (1994–2016)
- 2 Social Security Administration (SSA) Administrative Data

Estimation sample restrictions:

- 1 The age range is from 50 to 90
- 2 No missing data on key health-related variables and age
- 3 No missing initial conditions

HRS Questions on Disabilities Preventing Work

HRS has the following questions on disabilities preventing work:

- Do you have any impairment or health problem that limits the kind or amount of paid work you could do?
- Does this limitation keep you from working altogether?

I classify individuals by disability statuses as follows:

- **partially disabled** — those who have limitations that limit their work but do not prevent them from working altogether
- **fully disabled** — those who have limitations keeping them from working altogether

Table: Summary Statistics

	Full Sample	Estimation Sample
Working Full-Time, (%)	38.75	39.83
Working Part-Time, (%)	15.28	15.71
Applied for SSDI, (%)	1.29	1.42
Receive SSDI, (%)	6.82	6.15
Partially Disabled, (%)	16.35	16.21
Fully Disabled, (%)	10.27	9.74
Annual Wage, (2018 \$K)	52.43	52.16
Age	60.3	60.03
College, (%)	21.76	21.49
Number of Person-Years	147,612	121,348

Notes. Health and Retirement Study (HRS) Data. The full sample consists of all observations available on respondents from 51 to 70.

Self-Reported Disability Status is Unreliable

Questions on disabilities preventing work are unreliable because:

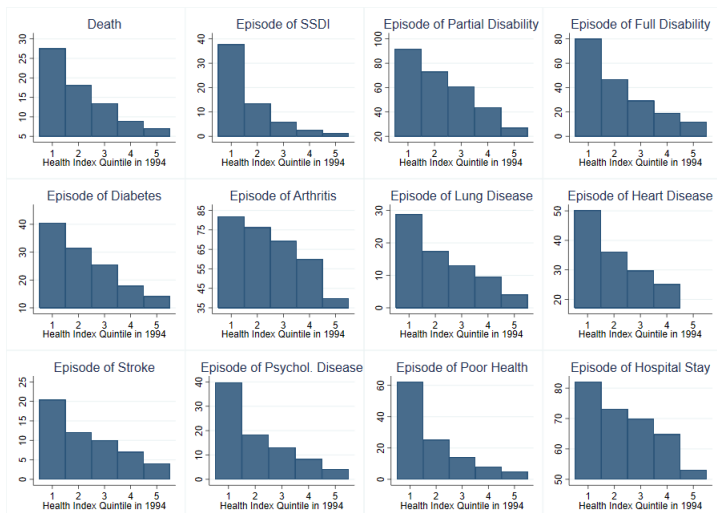
- People report themselves in poor health as a rationalization for what might otherwise be seen as socially unacceptable early retirement (Bound, 1991)
- 20% of HRS respondents who reported receiving SSDI benefits also reported that their disability does not prevent them from working altogether (Benitez-Silva et al., 2004)
 - So, 20% of SSDI beneficiaries admit they are cheating
 - How many respondents decided not to admit their fraud?

Health Index Construction

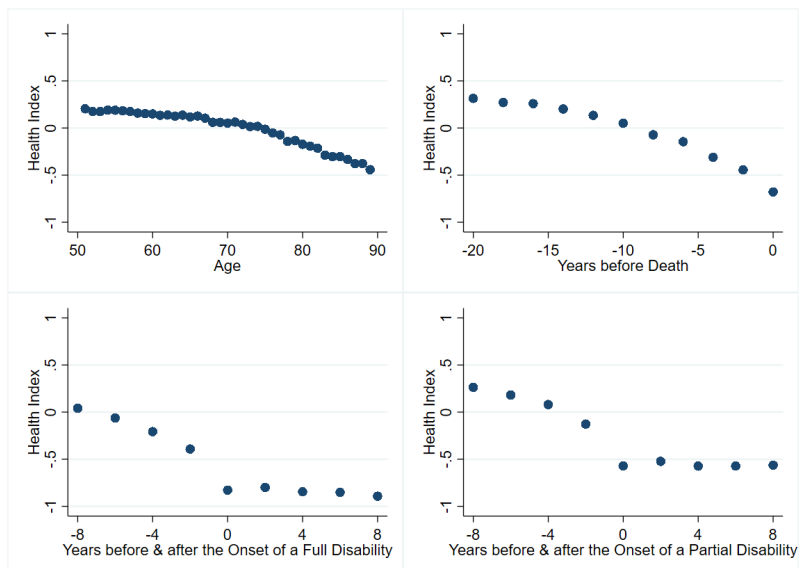
I construct a health index summarizing all available data on the individual health using principal component analysis for the following HRS health-related variables:

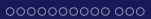
- 1 Self-reported health status (excellent/very good/good/fair/poor)
- 2 2 variables related to healthcare utilization
- 3 8 variables related to mental health issues
- 4 8 variables related to doctor-diagnosed health problems
- 5 10 variables related to difficulties with the activities of daily living and instrumental activities of daily living
- 6 Self-reported back pain

The Percentage of HRS Respondents Who Experienced Health Shocks by 2010 by Health Index Quintile in 1994

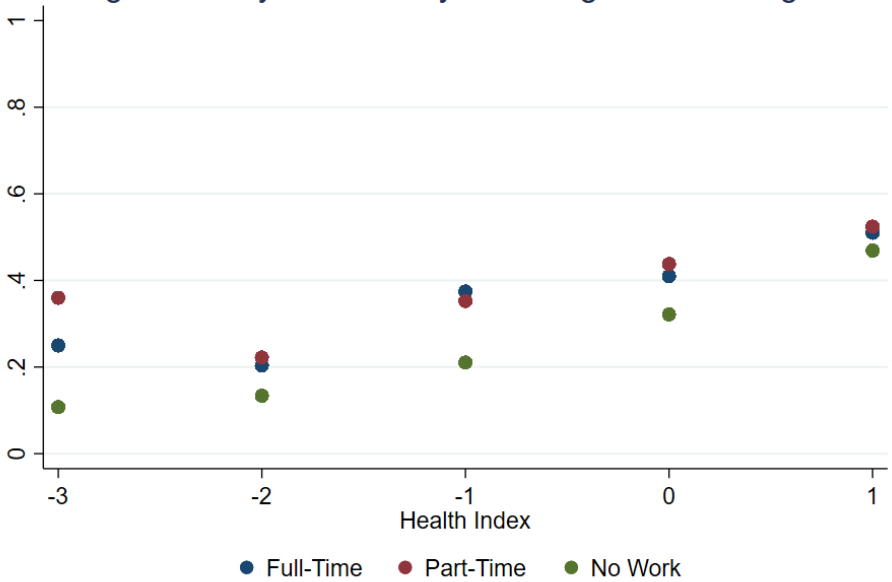


Health Index Dynamics





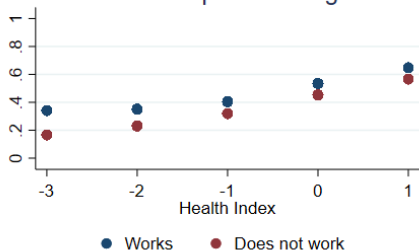
Vigorous Physical Activity Including Work Among PD



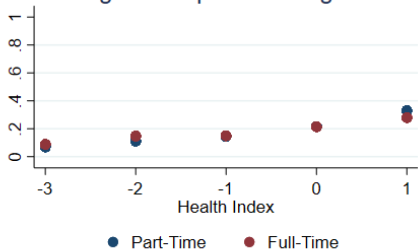
Vigorous Sports Among PD



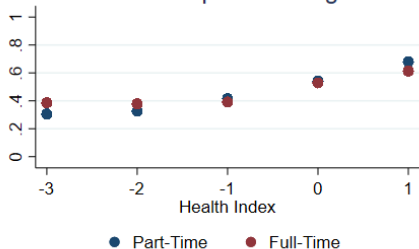
Moderate Sports Among PD



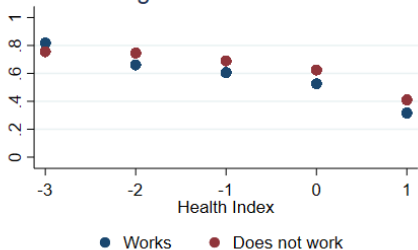
Vigorous Sports Among PD



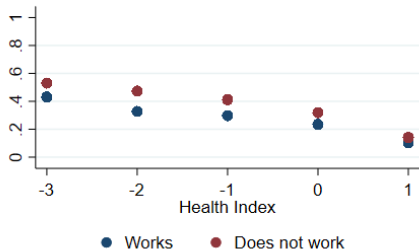
Moderate Sports Among PD



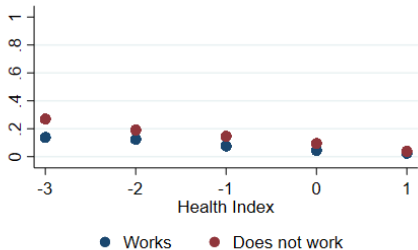
High Blood Pressure



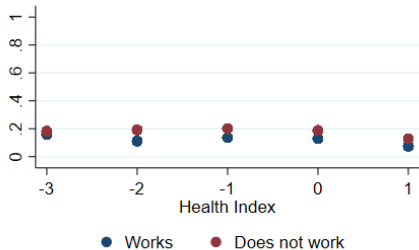
Heart Problems



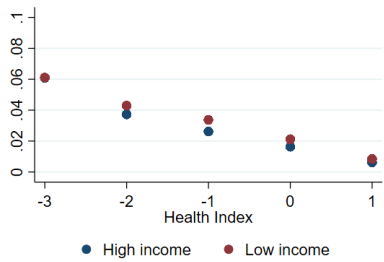
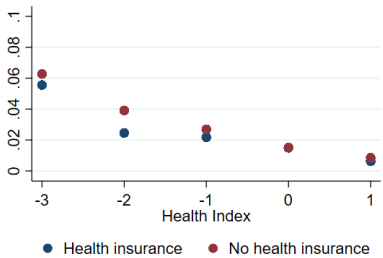
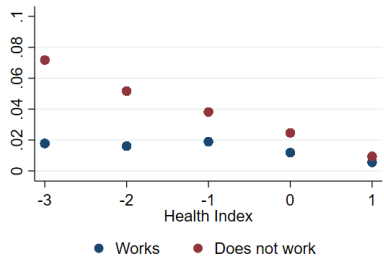
Stroke



Cancer

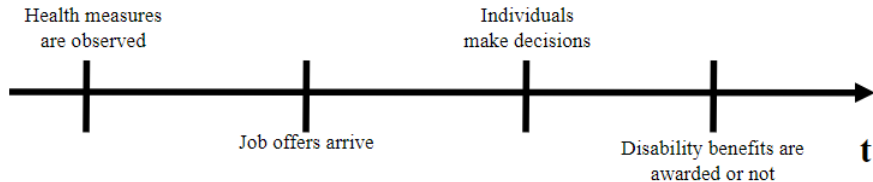


Mortality Rates for Partially Disabled



Model

Timing and Initial Conditions



Individuals make decisions when they are between 51 and 70

The set of initial conditions, $\Omega_{t_0}^i$, consists of initial year of observation, t_0 , age, $A_{t_0}^i$, disability, $D_{t_0}^i$, and SSDI reciprocity statuses, $SSDI_{t_0}^i$, and average indexed monthly earnings (AIME), $AIME_{t_0}^i$, at the initial period t_0 for an individual j

After a successful application, SSDI benefits are received starting the next period

Model

Decisions of Agents and Health Measures

- Agents make decisions about:
 - Labor supply: full-time, $w_t^i = 1$, part-time, $w_t^i = 2$, no work, $w_t^i = 0$
 - Disability insurance benefits application, a_t^i :
 - $a_t^i = 1$, if an individual is eligible for full SSDI benefits and claims them
 - $a_t^i = 2$, if an individual is eligible for partial SSDI benefits and claims them
 - $a_t^i = 0$, otherwise
 - Social Security Old-age (SSOA) benefits receipt starting year, s_t^i
 - $s_t^i = 1$, if an individual is eligible for SSOA benefits and starts benefits this year
 - $s_t^i = 0$, otherwise
- Health measures
 - Disability status: fully disabled (FD), $D_t^i = 1$, partially disabled (PD), $D_t^i = 2$, not disabled, $D_t^i = 0$
 - Health index, H_t^i , a continuous measure of health

Model

Utility Function

Utility = $\log(\text{Consumption})$ (Marginal utility of consumption) +

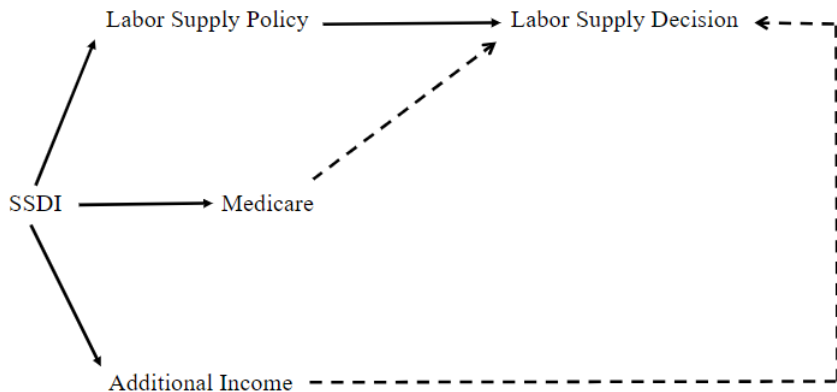
+ Utility of employment transitions +

+ Utility of SSDI application by disability and SSOA statuses,

All utilities are the sums of a constant and a coefficient times the health index

Model

SSDI and Labor Supply Decision



Model

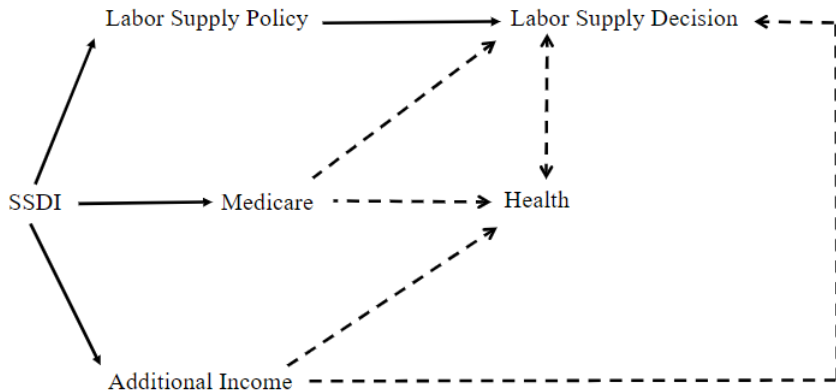
SSDI and Labor Supply Decision

SSDI affects labor supply decisions through

- restrictions on earnings: to be eligible for full SSDI, agents should not work $work_t^i = 0$
- additional income: Social Security benefits, $SSB_t^i = SSB(SSDI_t^i, AIME_t^i, t)$, depend on
 - Social Security Administration decision on the application, $SSDI_t^i$
 - Average Indexed Monthly Earnings, $AIME_t^i$
 - Current year, t

Model

Labor Supply Decision and Health



Model

Health measures

Mortality rate, $M_{t+1}^i(\cdot)$, disability status, $D_{t+1}^i(\cdot)$, health index, $H_{t+1}^i(\cdot)$, are the functions of previous

- labor supply decisions, w_t^i , by disability status, D_t^i , and education, E_t^i
- health insurance: I_t^i , by disability status, D_t^i , and education, E_t^i
- consumption: C_t^i , by disability status, D_t^i , and education, E_t^i
- disability status: D_t^i
- health index: H_t^i
- age: A_t^i
- college education: E_t^i

Model

Health measures

The effects of labor supply (w_t^i), consumption (C_t^i), and health insurance (I_t^i) on mortality rate, $M_{t+1}^i(\cdot)$, disability status, $D_{t+1}^i(\cdot)$, and health index, $H_t^i(\cdot)$, are β_t^{kli} , where $k \in \{w, C, I\}$ and $l \in \{M, D, H\}$

These effects are heterogeneous for the partially disabled:

$$\beta_{it}^{kl} = \gamma^{kl} + \epsilon_{it}^{kl},$$

where γ^{kl} is a constant and ϵ_{it}^{kl} is i.i.d. normal shock

Model

The probability of SSDI award, $\pi_t^{ai}(D_t^i, H_t^i, A_t^i, E_t^i)$, is determined based on a logistic function of

- disability status: D_t^i
- health index: H_t^i
- age: A_t^i
- college education: E_t^i

The probability of health insurance enrollment, $I_{t+1}^i(w_t^i, C_t^i, D_t^i, H_t^i, A_t^i, E_t^i)$, depends on the same variables as health outcomes

The earnings, $W_t^i(w_t^i, D_t^i, H_t^i, A_t^i, E_t^i, \epsilon_t^{Wi})$, are simulated as a linear combination of the same inputs as health outcomes, excluding consumption and health insurance, but including an i.i.d. normal shock, ϵ_t^{Wi}

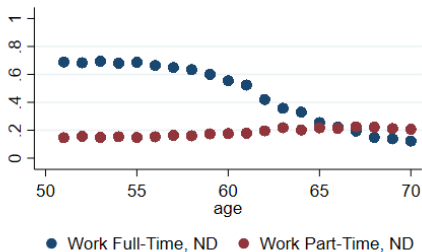
Model Solution

The model is solved numerically by backward recursion:

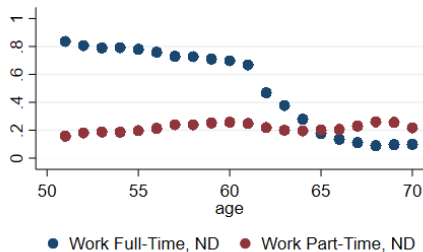
- At age $t_{max} - 1$, an individual makes optimal work and SS application decisions to maximize $V_{t_{max}-1}$
- The expected value of $V_{t_{max}-1}$, $EV_{t_{max}-1}$, is approximated by Monte Carlo integration, i.e., by taking draws from the shock vector distribution and averaging. 10 Monte Carlo draws for health and earnings shocks are used
- The calculations are done at a set of all possible deterministic state points (health index and AIME values are discretized into 4 values)
- This procedure is repeated at age $t_{max} - 2$

The approximations of EV_t are the solution to the optimization problem

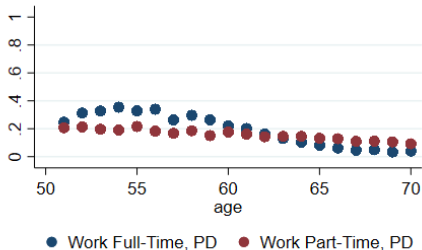
Data



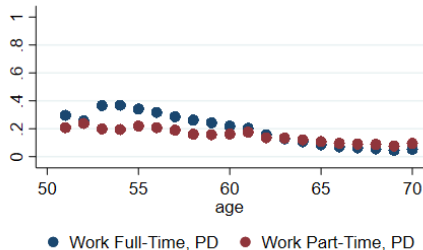
Simulations

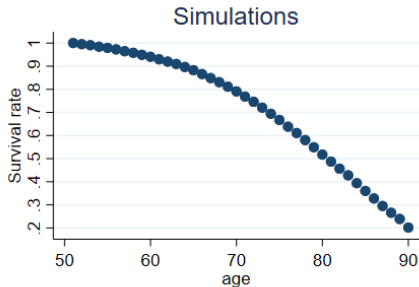
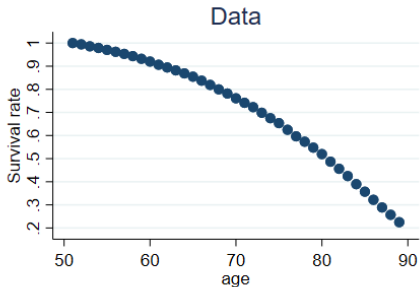
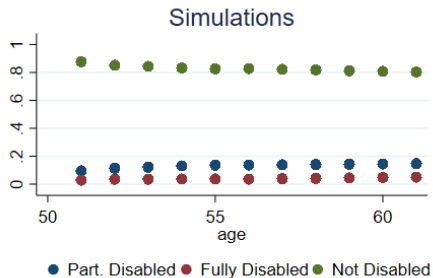
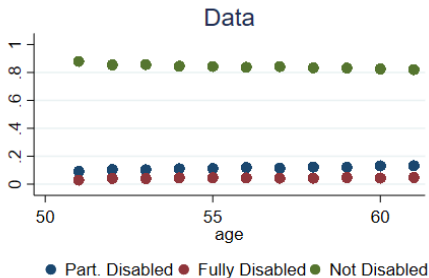


Data



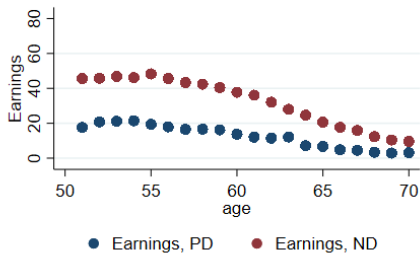
Simulations



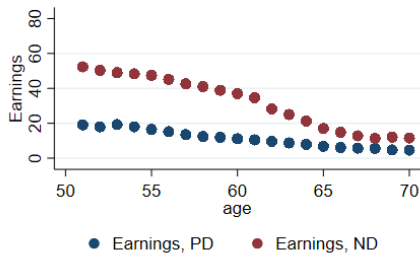




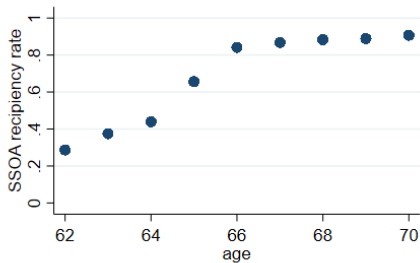
Data



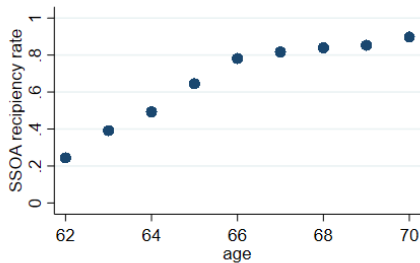
Simulations



Data



Simulations



Mortality probability (M)		
	AME of γ^{MJ} , %	AAME of ϵ_{it}^{MJ} , %
Full-time work for PD	-3.236898	.4912045
Part-time work for PD	-2.166466	.371798
Consumption for PD	-.0042363	.0032077
Health insurance for PD	-.2862383	.1139677
	AME, %	
Partial disability	2.789757	
Full disability	2.121026	
(Standardized) Health index	-.1591485	
Age	.0638079	

Notes: Health effects of full-time (FT) and part-time (PT) work, consumption (C), and health insurance (I) are heterogeneous for partially disabled (PD): $\beta_{it}^{MJ} = \gamma^{MJ} + \epsilon_{it}^{MJ}$, $\epsilon_{it}^{MJ} \stackrel{iid}{\sim} N(0, \sigma_{MJ}^2)$, $J \in \{FT, PT, C, I\}$, AAME — average absolute marginal effect, AME — average marginal effect, consumption is in tens of thousands of 2018 US dollars.

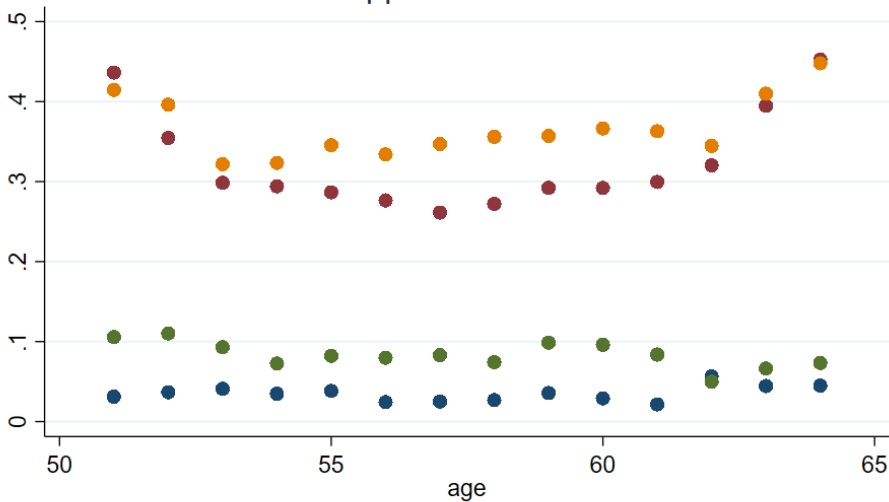
Partial disability probability (P)		
	AME of γ^{PJ} , %	AAME of ϵ_{it}^{PJ} , %
Full-time work for PD	-7.2787	1.6179
Part-time work for PD	-7.4576	6.6642
Consumption for PD	-.0074	.005
Health insurance for PD	-.0272	.0143
	AME, %	
Partial disability	24.95697	
Full disability	.0009264	
(Standardized) Health index	-104.1079	
Age	.1800817	

Notes: Health effects of full-time (FT) and part-time (PT) work, consumption (C), and health insurance (I) are heterogeneous for partially disabled (PD): $\beta_{it}^{PJ} = \gamma^{PJ} + \epsilon_{it}^{PJ}$, $\epsilon_{it}^{PJ} \stackrel{iid}{\sim} N(0, \sigma_{PJ}^2)$, $J \in \{FT, PT, C, I\}$, AAME — average absolute marginal effect, AME — average marginal effect, consumption is in tens of thousands of 2018 US dollars.

Full disability probability (F)		
	AME of γ^{FJ} , %	AAME of ϵ_{it}^{FJ} , %
Full-time work for PD	-15.9859	.6093
Part-time work for PD	.6166	4.7639
Consumption for PD	-.3128	.0306
Health insurance for PD	-.0243	.0034
	AME, %	
Partial disability	.0006748	
Full disability	16.38632	
(Standardized) Health index	-17.5932	
Age	.0355941	

Notes: Health effects of full-time (FT) and part-time (PT) work, consumption (C), and health insurance (I) are heterogeneous for partially disabled (PD): $\beta_{it}^{FJ} = \gamma^{FJ} + \epsilon_{it}^{FJ}$, $\epsilon_{it}^{FJ} \stackrel{iid}{\sim} N(0, \sigma_{FJ}^2)$, $J \in \{FT, PT, C, I\}$, AAME — average absolute marginal effect, AME — average marginal effect, consumption is in tens of thousands of 2018 US dollars.

Applied for SSDI



- Partially Disabled with Utility Costs
- Fully Disabled with Utility Costs
- Partially Disabled w/o Utility Costs
- Fully Disabled w/o Utility Costs

Private Health Insurance Logistic Regression

Parameter	AME
Full-time work for non-disabled	42.58%
Full-time work for partially disabled	22.16%
Part-time work for non-disabled	21.58%
Part-time work for partially disabled	2.25%

Earnings (in 2018 \$K) Regression

Parameter	Estimate
Full-time work for non-disabled	48.756
Full-time work for partially disabled	27.881
Part-time work for non-disabled	10.544
Part-time work for partially disabled	10.204

Counterfactual Partial Disability Insurance Reform

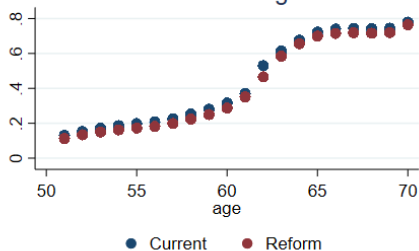
- As before, partially or fully disabled can apply for full disability insurance benefits
- Partially disabled can now apply for partial disability insurance benefits
- Partially disabled individuals applying for partial disability insurance benefits endure the same disutility as the fully disabled applying for fully disabled
- Partially disabled individuals applying for partial disability insurance benefits, on average, have the same probability of receiving an SSDI award as the fully

Counterfactual Partial Disability Insurance Reform

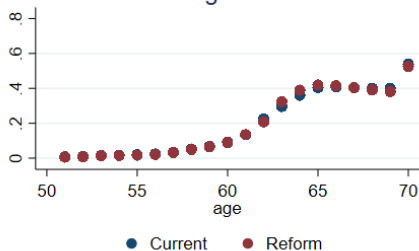
- Those who apply for and those who receive partial DI must continue working (either part-time or full-time)
- If earnings of a partially disabled person are above SGA amount (Substantial Gainful Activity amount, \$1,130/month in 2018), then their benefits are decreased by \$1 for each extra \$1
- Partial DI beneficiaries are not awarded Medicare
- If the partial disability insurance recipients claim they developed full disability and applied for full SSDI benefits, they are granted full SSDI benefits for the period of application



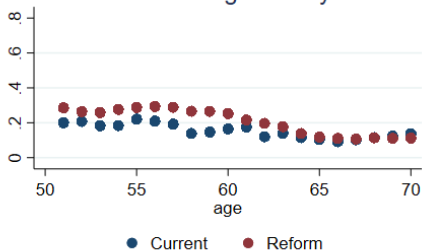
Non - Working All



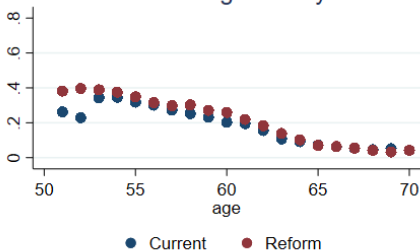
Non - Working Never Disabled



Part - Time Working Partially Disabled

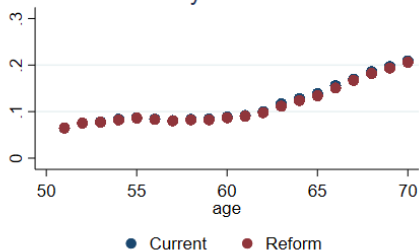


Full - Time Working Partially Disabled

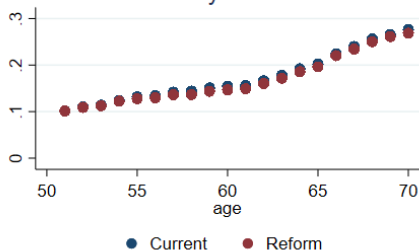




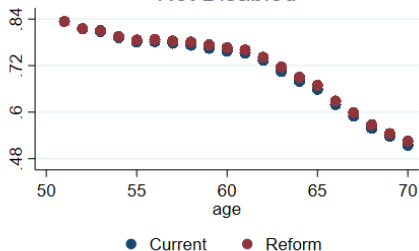
Fully Disabled



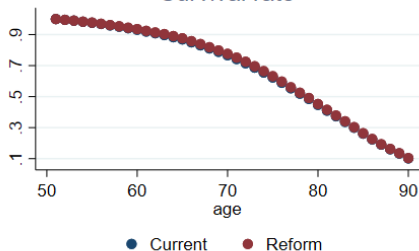
Partially Disabled

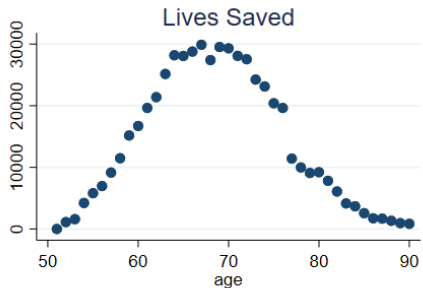
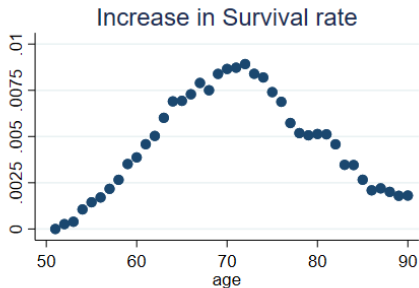
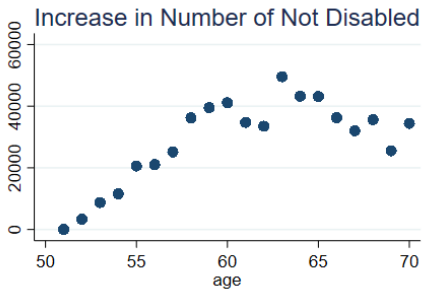
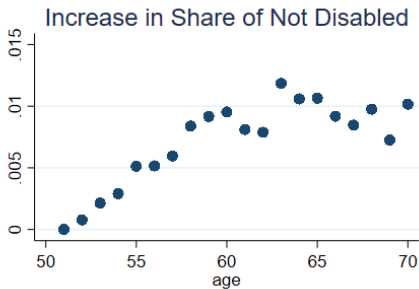


Not Disabled



Survival rate





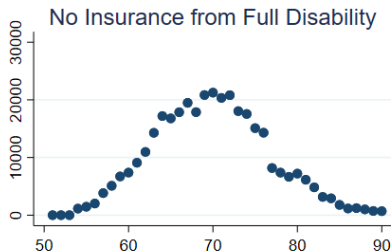
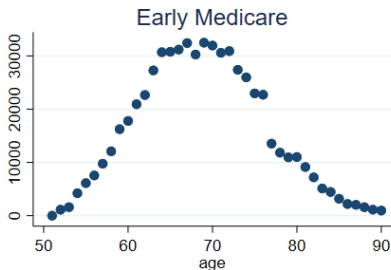
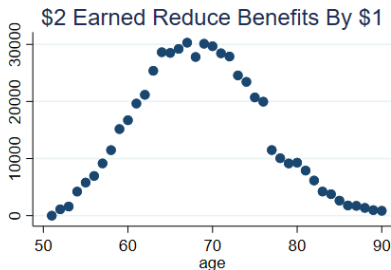
Alternative Designs of Partial Disability Insurance Reform

Four alternative designs are considered:

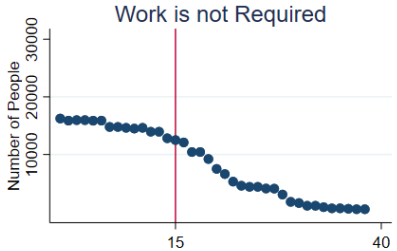
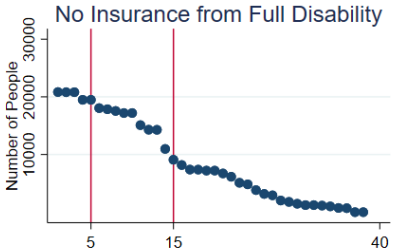
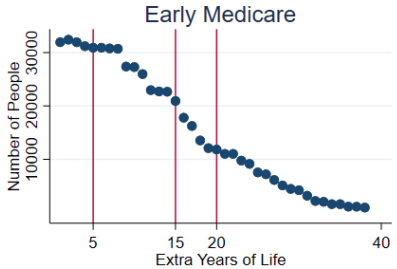
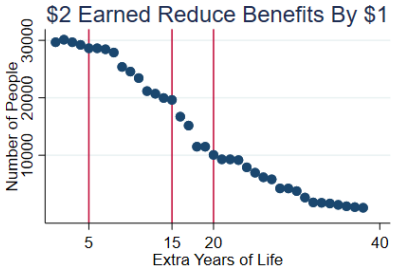
- Benefits are reduced by \$1 by \$2 extra dollars earned (instead of \$1 by \$1 under main specification)
- Partial DI beneficiaries are eligible for early Medicare after two years of benefits
- In case of full disability, no help is provided
- Work is not required for benefits



Number of Lives Saved



Effect on Life Longevity



Costs and Benefits of 5 Alternatives

Reform	People	Years	Cost per Year
Primary	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

The value of a life-year is:

- > \$100K for people below 90 (Murphy and Topel, 2006)
- \$120K (Miller et al., 1990)
- \$175K (Moore and Viscusi, 1988)

Partial Disability Insurance Reform Benefits

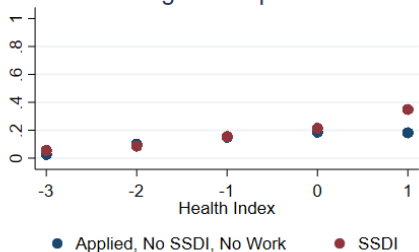
- The partially disabled increase their labor supply and postpone retirement if work is required
- Share of individuals who are not disabled decreases.
For 63-year-olds, this share decreases by ~ 1.2 p.p.
- Survival rate rises. For 70-year-olds, the survival rate increases by ~ 0.9 p.p.
- If the decrease in the share of disabled individuals and the survival rate is multiplied by the number of Americans of a given age in 2022, we can see that the introduction of partial disability insurance
 - Saves $\sim 30,000$ lives of 70-year-old Americans
 - Decreases the number of disabled 63-year-old Americans by $\sim 50,000$

Partial Disability Insurance Reform Drawbacks

- The number of disability insurance applications increases by 20%.
- After accounting for the increase in income taxes, the total cost of benefits increased by 8%.
- Social Security Administration will have to distinguish between fully disabled and partially disabled individuals
- Partially disabled individuals are more likely to fully recover in comparison with fully disabled ones



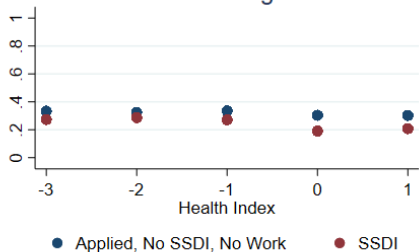
Vigorous Sports



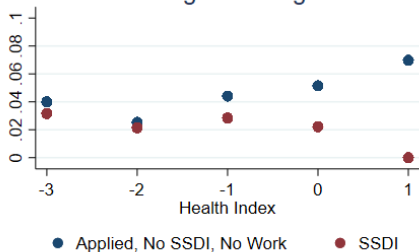
Moderate Sports



Smoking



Binge Drinking



Partial Disability Insurance Reform Conclusion

The introduction of partial disability insurance (DI) in the US will

- Increase labor supply of partially disabled individuals:
2M join the labor force and increase their earnings by a total of \$40B
- Increase the life span of $\sim 30,000$ people by 5 years, extend lives of $\sim 20,000$ by 15 years, and raise life longevity of $\sim 10,000$ by 20 years
- Decrease the number of disabled Americans by around 1%
- Cost of extending the life of one person by one year is \$17K

Plans

The following papers can expand the research on disability insurance:

- Early Medicare Saves Lives
- Disability Insurance for the Partially Disabled Would Come Handy During COVID-19 Pandemic
- How do The Effects of Disability Insurance on Health Vary with Gender, Race, and Education?
- How The Value of Private Disability Insurance Varies With Occupation and Industry?

Conclusion Remarks

- This paper is the first one to analyze the health effects of the introduction of disability insurance for the partially disabled in the US
- I reaffirm the existing results on the positive effects of this reform on the labor supply and the possible close-to-zero cost of the reform
- 5 different versions of the reform are discussed and analyzed
- According to the simulations, the reform will save tens of thousands of lives and will also improve the quality of lives of Americans