Division of Economics
A.J. Palumbo School of Business Administration and
McAnulty College of Liberal Arts
Duquesne University
Pittsburgh, Pennsylvania

Moral Hazard: Does Higher Unemployment Increase Social Security Disability Applications and Allowance Rates?

Ted Dischman

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This paper examines the potential for moral hazard in the U.S. Social Security Disability Insurance (SSDI) program, a possible substitute for unemployment insurance. The intention of SSDI is to provide benefits to workers who have suffered a medical impairment that leaves them unable to obtain gainful employment. This paper expands on previous research by controlling for SSDI ineligible groups, namely the population currently receiving disability benefits and individuals who are old enough to qualify for full Social Security retirement benefits. This paper finds that unemployment is consistently positively correlated with applications for SSDI, and consistently negatively correlated with the allowance rate, indicating the existence of moral hazard.

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Faculty Advisor Signature Page

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Matthew Marlin, Ph.D. Date

Professor of Economics

I. Introduction

Social Security Disability Insurance (SSDI) is a system managed by the Social Security Administration (SSA) and is intended to provide income supplements to individuals with certain physical or mental illnesses that prevent the individuals from participating in the labor force. SSDI is not intended or designed to be an assistance program for the unemployed or soon to be unemployed during declines in the business cycle. Considering the difficulty associated with determining whether or not an individual is truly disabled, moral hazard concerns may be present in the SSDI program. The moral hazard considered in this paper is the notion that some individuals are using SSDI as a form of unemployment insurance. It is unlikely that a greater prevalence of actual disability occurs during recessions than in other times. For an unemployed individual, the relative cost of applying for SSDI benefits is less than an employed individual, as an individual needs to be out of the labor force for five months prior to applying. Individuals out of work who are not truly disabled could, then, apply strictly due to the chance of succeeding. This process is reflective of moral hazard in SSDI.

II. Social Security Disability Insurance

The U.S.'s primary disability transfer programs are Social Security Disability Insurance and Supplemental Security Income (SSI). Regularly employed workers who suffer a disability that entirely prevents them from working are covered by SSDI. For those who do not have the time requirements to receive SSDI benefits, supplemental security income is in place to provide a cash benefit. Both programs are administered by the Social Security Administration.

Social Security included disability insurance in 1957 to provide early retirement insurance to individuals who are "totally and permanently disabled". The original law required an individual between the ages of 50-64 to have worked in covered employment, which is paying

SS taxes, for 20 of the last 40 quarters and 6 of the last 13 quarters as well as the quarter before the disability. A disability was defined as "an individual being incapable of any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or be of long or indefinite duration."

Future structural changes in SSDI vastly changed the potential beneficiaries. Amendments made in 1960 include dropping the age requirement. In 1965 the definition of disability changed to impairments expected to last at least a year. An amendment in 1970 provided Medicare for SSDI recipients after 24 months of receiving SSDI. Autor and Dugan (2006) attribute a recent general trend in the growth of the SSDI program to a wide-scale liberalization of the screening process in 1984. This change led to a greater quantity of awards and shifted the composition of recipients towards claimants with lower mortality disorders, such as arthritis or back pain. Lowering screening to include individuals with lower mortality-disabilities resulted in new beneficiaries receiving a longer duration of benefits. Currently, four impairments make up roughly 70% of the SSDI beneficiary population: heart disease, cancers, mental impairments, and musculoskeletal disorders. As of 2013, around 40% of applications for SSDI benefits are successful.

Using earnings data gathered for Social Security, averaged indexed monthly earnings (AIME) are used to determine the level of disability benefits. For individuals 43 and up, five years of lowest earnings are excluded, and younger individuals have a proportional number of low earning years excluded. If awarded benefits, workers receive the same benefits as they would upon reaching The Full Benefit Age for Social Security retirement. The system is designed so very low-income workers receive a high proportion of their AIME (90%), and

increases in income result in a proportional decrease in income replacement. After two years of benefits, beneficiaries receive health insurance through Medicare.

Enrollment in SSDI is permanent until one of three events occur. The first event is when a claimant dies. The second is when the claimant reaches full retirement age and receives benefits through Social Security retirement benefits. The third event is when an individual no longer fits the medical standards for SSDI. An individual may reenter the labor force and receive income in excess of the Substantial Gainful Activity Level (SGA), which is a monthly income of $1,070 for non-blind individuals in 2014. After an individual receives benefits, a trial work period is available to incentivize reentry into the labor force. In this period an individual can collect benefits and receive an income. The SGA amounts change generally with changes in national average wage index. SSA can also conduct reviews of beneficiaries in order to determine whether they are still disabled. In 2004, death was the cause of 42% of exiting beneficiaries leaving SSDI, where entering full retirement age was 44% of exiting beneficiaries, and 14% of exiting beneficiaries no longer met the standards for participation (Autor 2006).

Unemployment Insurance is a state program where an individual receives benefits for being unemployed. The structure of unemployment insurance normally incentivizes beneficiaries to return to work. Benefits from unemployment insurance are temporary. The amount of benefits from unemployment insurance is less than benefits from SSDI, and unemployment insurance does not offer Medicare to beneficiaries after a certain period of time.

III. Literature Review

Duggan and Singleton (2007) examine how changes in Social Security Retirement Benefits have affected SSDI enrollment. Using population data from the US Census Bureau,

health data from the National Center for Health Statistics and Social Security data from SSA, the authors find that the changes of the full benefit retirement age in 1983 from 65 to 67 and the reduction of benefits for early retirees resulted in Social Security disability enrollment increasing. The authors found that there was a significant increase in SSDI enrollment after 1983, and that the trend will continue for the next two decades.

Autor and Duggan (2003) find that the 60% increase in nonelderly adults receiving SSDI in the U.S. during the 80's and 90's can be attributed to reduced screening rigor, higher in-kind Medicare benefits received, and a rising cash income replacement rate. Data used was Current Population Survey data from 1978 to 1999 across states.

Bound (1999) provides a history of structural changes in SSDI and SSI and reviews evidence that attempts to explain their growth. This paper also examines how the labor supply of people with disabilities is affected by these changes. The authors find that "…prevalence of disability transfer recipients per worker has increased at all working ages over the last quarter of a century in the United States… coincides with an increase in both access to and the generosity of publicly provided social insurance and social welfare programs targeted at people with disabilities in the industrialized world". In other words, the author finds that SSDI is growing at all age levels as a result of a more generous disability program.

Gruber and Kubik (1997) consider efforts to mitigate moral hazard effects in the SSDI program by raising stringency in the screening process. Using data from the National Health Interview Survey from 1976-1978 (before policy change) and 1980-1982 (after policy change), and considering males age 45-64, the authors find increases in the denial rate for DI increases participation in the labor force. In other words, the authors find evidence for moral hazard in SSDI. This result does not include a comparison of welfare gains due to mitigating labor force

distortions for able-bodied workers against the welfare costs to truly disabled workers, something that the authors feel should be considered.

Parsons (1991) finds that rates of application rise when screening becomes more lenient, and discusses the difficulty of designing a perfect DI policy. The author states, using a study by Paula Franklin, that recipients of disability benefits do not tend to actively seek work above the substantial gainful activity level. This finding stems from the fact that receiving disability benefits is a difficult process, and to work at a level where DI benefits will still be available (below the SGA level) will raise flags about actual disability. As a result, individuals with the ability to work will avoid doing so. The obvious response, then, would be to make the screening process more stringent and less attractive to truly non-disabled workers (such as individuals needing to be out of the labor force for five months before receiving benefits). This solves the problem of marginal claimants, but does so at the expense of those who are truly disabled. The author suggests restructuring the screening process to achieve a more appropriate acceptance rate.

Using a panel survey from 1966-1976 of males 45-59 from the NLS, Parsons (1980) works to find determinants of labor force participation for the older male demographic. Wage rate, unemployment experience, potential Social Security benefits, community welfare, and 'mortality experience' are used to determine labor force participation. Mortality experience is an objective method of measuring physical disability. The author finds that labor force participation is significantly negatively correlated with Social Security benefits, community welfare, unemployment experience, and the morality index. The authors find that, even though SSD programs are structured and conditioned by health status, the decline in labor force participation is a result of SSD's growing attractiveness.

Wachter et al (2011) examine how denials at certain levels of the SSDI screening process coincide with the SSDI applicant return to the labor force. The paper uses data that includes educational differences, type of injury, and whether the applicant was approved for DI, and in the case of denial, at what level the denial occurred. The term level refers to what part of the screening process resulted in denial. The paper finds that worsening of economic conditions coincides with higher applications in SSDI.

Bound (1989) considers how rejection from SSDI affects labor force participation and interprets the results to determine whether the prevalence of individuals on SSDI benefits could work if given no other income. Data on rejected applicants was from the 1972 survey of disabled and non-disabled adults and the 1978 Survey of Disability and Work. The author also uses historical findings to develop support for the finding that there is a portion of those on SSDI who could work, but the majority of beneficiaries would not be able to work if SSDI benefits were not available.

Haveman, Jong, and Wolfe (1991) propose a model that corrects for potential endogeneity associated with self-reported health impairments and the decision to participate in the labor force. Using data from the 1978 Social Security Survey of Disabled and Nondisabled adults, the authors find that no more than 20% of the decrease in labor force participation for older males can be attributed to raising Social Security benefits and easing the screening process. The authors also find that instrumenting for disability does not change the sign of the relationship between disability and participation in the labor force.

Using data from the first Health and Retirement study, a study involving detailed questioning of individuals born between 1931to 1941 about their labor force participation, health, access to transfer programs, and general wealth, Kreider (1999) sought to develop a better

reflection of a worker's disability than the typical method of using self-reported disability from the SSA. Empirical findings include over-reporting disability for non-workers.

Burkhauser, Butler and Weathers (2002) analyze how policy variables, such as SSDI allowance rates and benefits levels, affect the timing of application for SSDI benefits. The allowance rate is the proportion of applications for SSDI that result in benefits. Data used is from the Health and Retirement Survey. The authors find that most workers do not apply for benefits when the health impairment begins to affect the worker. The paper addresses potential endogeneity concerns associated with the inclusion of self-reported disability as an independent variable. The endogeneity concern is founded on the notion of reverse causality occurring where changes in SSDI allowance rate results in individuals claiming disability. The authors find that this endogeneity concern is unfounded, and disability prevalence is an indicator of SSDI-participation.

Strand (2002) asks what causes variation in allowance rates for SSDI across states. The study uses data from 1997-1999 from the SSA, and finds that changes in health trends and the economy are the main contributors to variations in the allowance rate. The paper finds that variations in allowance rates across states is less than optimal, and has room for improvement. This paper uses differences in actual allowance rates with the predicted allowance rates to come to this conclusion.

Rupp and Stapleton (1995) examine what factors have contributed to the growth of applications and payouts for SSDI and SSI while accounting for structural changes in each program. Factors of interest include economic factors, such as the relative advantages of working and not working, and structures of disability insurance including duration of payout and cost of applying. Noneconomic factors are also considered, including immigration, AIDS and

the number of single parent applicants. Data used is from 1988-1992 and is from the disability research file. The authors find that recessions contribute to the number of SSDI applications.

Xuguang and Burton (2012) continue research on what population characteristics affect SSDI applications by including detailed worker's compensation variables that include expected benefits as well as compensability rules. Other independent variables include SSDI replacement ratio, disability prevalence, previous month disability acceptance ratio, and unemployment. The SSDI replacement ratio is the relative attractiveness of disability benefits and is calculated by dividing average monthly SSDI benefits by average monthly wages. Data is from 46 states from 1981 to 1999. The authors find that the relationship between expected worker's compensation benefits and SSDI application is negative. The authors also find a positive relationship between applications and the level of unemployment across states.

IV. **Model**

The seasonally-adjusted unemployment regressor is key in determining whether SSDI can potentially be used as a substitute for unemployment insurance. If people view SSDI as potential unemployment insurance, an increase in the unemployment rate will result in an increase in the proportion of the population applying for SSDI.

Proportion of population between age 50 and 65 is included to account for a population that is more predisposed to disability given their relative lack of physical health. If a positive relationship results, the result will demonstrate that these individuals are predisposed to disability.

Proportion of population above 65 is included to account for the population that is eligible for full Social Security Retirement benefits. SSDI benefits are identical to full

retirement benefits. The application process for SSDI is a relatively costly process, in consideration of the fact that the only requisite to receiving full retirement benefits is that an individual be of a certain age. As benefits are identical, and applying for SSDI is a relatively costly process, as an individual needs to fully demonstrate inability to work at above the SGA level, it follows that proportion of population above age 65 should have a negative relationship with the number of SSDI applications.

Unemployment insurance replacement ratio is a gauge of the attractiveness of state provided unemployment insurance. If SSDI is being used as a form of unemployment insurance, an increase in the attractiveness of unemployment insurance should result in a decrease in SSDI applications.

SSDI replacement ratio is a gauge of the relative attractiveness of SSDI and is calculated by dividing average monthly SSDI benefits by average monthly earnings. With a more attractive SSDI program, a higher proportion of applications should result.

Disability prevalence is a measure of the number of disabled in a population at a given time. It follows that a greater incidence of disability should result in a higher amount of SSDI applications.

The poverty rate is included to consider whether individuals in lower skilled occupations are more predisposed to disability. If this population is, its relationship with applications should be positive.

Proportion of population currently receiving benefits is included as benefits are rewarded indefinitely until death, retirement or gaining the ability to reach a level of income above the Substantial Gainful Activity level under SSDI. It then follows that this segment of the

population is essentially out of the application process. Therefore, a greater proportion of the population receiving benefits should result in a decrease in SSDI applications.

Previous month acceptance rate gauges the public notion of the leniency of SSDI. It follows that applications are expected to increase as a result of an increase in the previous month acceptance rate.

The models in equations (1) and (2) use SSDI applications as the dependent variable. Net applications and control variables used are adopted from previous literature (Xuguang, Burton). The novel feature of the model is the inclusion of proportions of populations that have little incentive to apply for SSDI, namely those above 65, and those who are already receiving disability benefits. The model in equation (1) is the parsimonious version of model in equation (2), which includes the full set of regressors and is the main focus of the paper.

$$Y_{ij} = \alpha_{it} + \beta_1 UNEMP_{it} + \beta_2 DIRR_{it} + \beta_3 DISPREV_{it} + \varepsilon_{ij} \quad (1)$$

$$\begin{aligned} Y_{ij} = \alpha_{it} + \beta_1 UNEMP_{it} + \beta_2 DIRR_{it} + \beta_3 DISPREV_{it} + \beta_4(\Delta POPBET50and65_{it}) + \\ \beta_5(\Delta POP65OLDER_{it}) + \beta_6 UIRR_{it} + \beta_7 POVRATE_{it} + \beta_8 POPRECEIVING_{it} + \\ \beta_9 PREVMONACTRATE_{it} + \varepsilon_{ij} \end{aligned} \quad (2)$$

Table 1: Variable Definitions

Y_{it}	Applications
α_{it}	Panel Constant Term
$UNEMP$	Seasonally-Adjusted Unemployment
$DIRR$	Disability Insurance Replacement Ratio
$DISPREV$	Disability Prevalence
$POPBET50and65$	Proportion of Population between 50 and 65
$POP65OLDER$	Proportion of Population older than 65
$UIRR$	Unemployment Insurance Replacement Ratio
$POVRATE$	Poverty Rate
$POPRECEIVING$	Proportion of Population receiving disability benefits
$PREVMONACTRATE$	Previous month allowance rate
ε_{it}	Panel error term

The following considers allowance rate as the dependent variable. The applications process is consistent over the time period of data. If non-truly disabled individuals are applying for benefits, a higher number of fraudulent claims will be received. Given the consistent nature of the screening-process over the time period used, a greater proportion of claims will be denied. Thus, if moral hazard is present, a negative relationship between the allowance rate and unemployment will be present.

A positive relationship between the population between 50 and 65 will indicate that this population files a relatively higher proportion of non-fraudulent claims. The population above 65 should not affect the allowance rate, as this population should not participate in the applications process for SSDI.

The increase in the relative attractiveness of unemployment insurance would result in relatively less attractive SSDI benefits. If moral hazard is present, fraudulent individuals will apply less. It follows that the relationship between the unemployment insurance replacement ratio and allowance rate would be negative.

If moral hazard is present, a more attractive SSDI program will result in more fraudulent claims. The relationship, then, between allowance rate and SSDI replacement ratio should be negative.

If the screening process is effective, disability prevalence should not affect the allowance rate, as disabled individuals will receive benefits and nondisabled applications will be rejected. The poverty rate should not affect the allowance rate. The proportion of the population receiving benefits should not affect the allowance rate.

Models (3) and (4) have SSDI allowance rate as the dependent variable (Strand). Model (3) is the parsimonious model and serves as a robustness check, and model (4) is the full model and is the point of focus

$$\Omega_{ij} = \upsilon_{it} + \omega_1 UNEMP_{it} + \omega_2 DIRR_{it} + \omega_3 DISPREV_{it} + \theta_{ij} \quad (3)$$

$$\Omega_{ij} = \alpha_{it} + \omega_1 UNEMP_{it} + \omega_2 DIRR_{it} + \omega_3 DISPREV_{it} + \omega_4(\Delta POPBET50and65_{it}) + \omega_5(\Delta POP65OLDER_{it}) + \omega_6 UIRR_{it} + \omega_7 POVRATE_{it} + \omega_8 POPRECEIVING_{it} + \theta_{ij} \quad (4)$$

Table 2: Variable Definitions

Ω_{it}	Allowance Rate
ϕ_{it}	Panel Constant Term
$UNEMP$	Seasonally-Adjusted Unemployment
$DIRR$	Disability Insurance Replacement Ratio
$DISPREV$	Disability Prevalence
$POPBET50and65$	Proportion of Population between 50 and 65
$POP65OLDER$	Proportion of Population older than 65
$UIRR$	Unemployment Insurance Replacement Ratio
$POVRATE$	Poverty Rate
$POPRECEIVING$	Proportion of Population receiving disability benefits
θ_{it}	Panel error term

V. Data

Data used in this analysis is panel data across the fifty U.S. states plus the District of Columbia. The time series is monthly ranging from Oct. 2000 to Dec. 2012. Applications data is the sum of the number of applications for SSDI only and concurrent applications for DI and SSI. Allowance rate is the proportion of successful applications for SSDI that result in benefits divided by the total number of SSDI applications. The disability benefits replacement ratio is a measure of the attractiveness of SSDI benefits and is calculated by dividing average monthly disability benefits by average monthly earnings. Proportion of population receiving disability benefits is the population receiving any form of governmental disability benefits divided by the population. Applications data, benefits data and recipient's data is from the Social Security Administration. All data from SSA is monthly. Disability prevalence is the number of self-reported disabled from the American Community Survey and is deviated yearly. Disability is defined as having difficulty with vision, hearing, ambulatory, or cognitive functions. Non-self-reported disability data was not available for the time period of this study. Previous research (Burkhauser), however, has found that self-reported work limitations is a strong predicator of DI participation. Unemployment is cyclically adjusted unemployment from the BLS and is deviated monthly. The age 50-65 and age 65+ are proportions of populations that are within that age demographic. Population data have unit roots and are corrected by using first-differenced data. Population data is intercensal, annually deviated, and is from the U.S. census. The unemployment replacement ratio is the relative attractiveness of unemployment insurance and is calculated by dividing average monthly unemployment insurance payment by average monthly wage. Unemployment insurance payout data is from the U.S. Department of Labor and is deviated monthly. Poverty is the proportion of people below the poverty line. Poverty data is from the U.S. census and is deviated annually.

VI. **Results**

There is potential for cultural differences and other unobserved factors across states affecting the number of SSDI applications. For example, an unemployed individual in Alabama may not experience as much social stigma for applying for SSDI benefits as a person in California. The Hausman test is used to test for the existence of these unobserved, time-invariant factors. The Hausman test demonstrates that variation across states is systematic, and the model should, therefore, be estimated with state fixed effects. Yearly dummies are also included in the model to account for structural changes in SSDI, the impact of recession not accounted for in unemployment, as well as omitted yearly occurrences.

Multicollinearity is not present in the full model. The Breusch-Pagan test indicates the presence of heteroskedacticity in the disturbance. The Wooldridge test indicates that first order autocorrelation in panel data is present in the disturbance. The Peseran test indicates that contemporaneous correlation across cross-sectional units is also present[1].

To account for these anomalies, a two-way fixed effects OLS regression with Driscoll-Kraay standard errors is used. Driscoll-Kraay standard errors correct for heteroskedastic, temporally and contemporaneously correlated distrubances. These standard errors are robust to general forms of cross-sectional and temporal dependence when the time dimension becomes large. Because this nonparametric technique of estimating standard errors places no restrictions on the limiting behavior of the number of panels, the size of the cross-sectional dimension in finite samples does not constitute a constraint on feasibility (Driscoll). Models using clustered-

[1] A correlation matrix testing for multicollinearity, as well as the null hypothesis and findings for each of these tests, can be found in the appendix.

standard errors that correct for heteroskedacticity and autocorrelation are also included to serve as robustness checks.

Table 3: The Determinants of Monthly SSDI State Applications [2]

Variable Name	Parsimonious Estimation with Clustered Standard Errors	Estimation with Clustered Standard Errors	Parsimonious Estimation with Driscoll/Kraay Standard Errors	Estimation with Driscoll/Kraay Standard Errors
Unemployment rate	15281.17** (7594.725)	4834.975 (4358.861)	15281.17*** (2392.562)	4834.974** (2293.273)
SSDI Replacement Ratio	6028.65*** (1668.904)	7766.637* (4121.525)	6028.65*** (2183.345)	7766.637*** (2554.857)
Disability Prevalence	.0086014*** (.0025434)	.009653*** (.0025556)	.0086014*** (.0014304)	.009653*** (.0013762)
Δ Proportion of population between 50 and 65	-	-66371.63*** (21418.36)	-	-66371.63*** (23002.22)
Δ Proportion of population above 65	-	-35219.75** (15733.15)	-	-35219.75 (46707.02)
Unemployment Insurance Replacement Ratio	-	449.9198 (2799.415)	-	449.9198 (858.7491)
Previous Month Acceptance Rate	-	1333.53** (624.3117)	-	1076.092*** (330.2434)
Poverty	-	-3304.793 (2985.868)	-	-3304.793 (1964.068)
Disability Beneficiary Proportion of Population	-	-5412.74 (3150.546)	-	-5412.74*** (587.9753)
Constant	-285.7716 (771.1006)	-629.9881 (1403.356)	-285.7716 (457.1694)	-629.9881 (558.7951)
R^2	0.2535	0.2725	0.2535	0.2725

7353 observations. State and year dummies are not reported. Standard errors are in parentheses. Significant at *90%, **95%, ***99%

[2] Results with application proportion of population as dependent variable and models without proportions of populations are included in the appendix.

The results[4] show that the variable of interest, unemployment, is statistically significant at 95% and has the sign that is reflective of moral hazard. An increase in the level of unemployment leads to a higher number of applications, suggesting that individuals interpret the SSDI program as a potential form of unemployment insurance.

The first-differenced proportion of population between 50 and 65 is negative and significant. These results indicate that having a younger population leads to a greater number of SSDI applications. This could be the result of younger workers finding SSDI benefits more attractive, as the potential length of benefits will be longer.

The first-differenced proportion of the population above 65 does not have a significant effect on the number of applications. These results indicate that the proportion of the population eligible for SS retirement benefits does not affect the number of applications.

The unemployment replacement ratio regressor is not significant, demonstrating that the relative attractiveness of unemployment insurance does not impact the number of applications. This result indicates that individuals do not consider the interaction between their relative unemployment insurance and the decision to apply for SSDI.

The replacement ratio for SSDI is positive and significant. As the replacement ratio demonstrates the relative fiscal attractiveness of SSDI benefits, a positive relationship involved with it and applications is consistent with intuition.

[4] The results using clustered standard errors do not correct for the contemporaneous correlation found from the Peseran test. As a result, the full model with Driscoll-Kraay standard errors will be the point of focus for models (1) with the parsimonious regressions and regressions with clustered standard errors serving as robustness checks.

Previous month acceptance rate is positive and significant. This result demonstrates that interpretation of the program becoming more lenient results in a higher number of applications. This relationship follows with intuition.

The positive sign and significance of disability prevalence is self-explanatory. Poverty is insignificant demonstrating that the proportion of individuals in poverty does not affect SSDI applications. A possible rationale could be the result of poor individuals being out of the labor force for long durations, which would put them in a position that is out of harm's way.

The disability-benefit population proportion is significant and negative. The negative relationship states that a higher proportion of disability beneficiaries results in a decrease in applications. This result makes sense, as these individuals are already receiving benefits, they are essentially out of the potential application population.

Table 4. Determinants of SSDI Allowance Rates

Variable Name	Parsimonious Estimation with Clustered Standard Errors	Estimation with Clustered Standard Errors	Parsimonious Estimation with Driscoll/Kraay Standard Errors	Estimation with Driscoll/Kraay Standard Errors
Unemployment rate	-1.270141*** (.2546818)	-125.7542*** (41.11287)	-127.0141*** (1595.959)	-65.90432*** (9.11279)
SSDI Replacement Ratio	-24.30926 (18.24962)	-47.62718 (41.2006)	-24.30926*** (8.831638)	-17.5782** (7.997235)
Disability Prevalence	-4.71e-07 (5.64e-06)	7.22e-06 (9.86e-06)	-4.71e-07 (1.32e-06)	1.21e-06 (1.18e-06)
Δ Proportion of population between 50 and 65	-	-116.6739*** (31.3417)	-	-29.56573 (43.26779)
Δ Proportion of population above 65	-	-165.5751 (118.5934)	-	-80.57236 (120.0175)
Unemployment Insurance Replacement Ratio	-	17.83907 (23.50017)	-	9.798627** (4.19547)
Previous Month Acceptance Rate	-	-25.72665 (22.98581)	-	-8.35122 (6.66341)
Poverty	-	37.19092 (26.30874)	-	16.44855*** (3.018243)
Disability Beneficiary Proportion of Population	49.23417*** (3.455753)	46.5525*** (5.659604)	49.23417*** (1.369794)	16.41366*** (1.15344)
Constant	49.77005*** (3.406523)	16.52114*** (2.638182)	49.23417*** (1.369794)	16.41366*** (1.15344)
R^2	0.2138	0.5585	0.2138	0.5585

7353 observations. State and year dummies are not reported. Standard errors are in parentheses. Significant at *90%, **95%, ***99%

The relationship between unemployment and SSDI allowance rate is negative and significant. It follows then that a greater proportion of fraudulent claims are received in periods

of high unemployment. Individuals, then, are applying for SSDI benefits regardless of disability following unemployment. This result is consistent with the moral hazard conjecture.

The unemployment replacement ratio is insignificant. It follows that the proportion of applications being approved is not a result of the relative attractiveness of unemployment insurance. The relationship between the allowance rate and SSDI replacement ratio is significant and negative, demonstrating that a more attractive disability insurance program results in a higher proportion of fraudulent claims. This is consistent with moral hazard, as the negative relationship implies individuals apply because of SSDI benefits relative attractiveness and not because of disability.

The insignificance of disability demonstrates that the system is an effective at screening. The negative relationship between poverty and the allowance rate could be reflective of the demographic in poverty being more predisposed to fraudulently apply for SSDI.

VII. Implications

The results above indicate that SSDI is seen as a form of unemployment insurance. To what extent, though, is moral hazard an economic problem? The elasticity of unemployment from equation (2) with Driscoll/Kraay Standard Errors is .07, indicating an inelastic relationship between the amount of SSDI applications and the level of unemployment. The elasticity of unemployment from equation (4) with Driscoll/Kraay Standard Errors is -.10, again indicating an inelastic relationship between the allowance rate for SSDI and the level of unemployment. These results demonstrate that the economic impact of moral hazard, although present, is not substantial.

Considering the importance of SSDI to truly disabled individuals (Bound, Rupp), the benefits of SSDI are clearly present. The elasticities above indicate the moral hazard cost of SSDI through the perception of unemployment insurance is relatively low. Combined, these two results give support to the argument that SSDI is effectively addressing unemployment insurance moral hazard concerns, and an overhaul of the program addressing unemployment insurance moral hazard concerns is not necessary at this time.

VIII. Conclusion

The purpose of this paper was to consider potential moral hazard in SSDI through the interpretation of the program as unemployment insurance. The opportunity cost of applying for SSDI is small for the unemployed as individuals may already be out of the labor force for the five month waiting period. As a result, non-truly disabled individuals may be willing to apply for SSDI benefits even if the chances of them qualifying are low. This incentive coupled with the imperfect screening process creates a system where moral hazard may be present.

It is unlikely that more individuals become disabled in periods of high unemployment. With this view in mind, this paper tests for a positive correlation between the unemployment rate and the number of applications. While controlling for important influences on the number of applications, such as proportions of populations essentially unable to apply for benefits as well as the relative benefit of unemployment insurance, this paper found through a panel analysis that SSDI applications are consistently positively correlated with unemployment.

The second model asked whether the allowance rates for SSDI benefits are affected by the unemployment rate. The notion is that with a higher level of unemployment, non-truly disabled would take a shot at applying for SSDI considering the low cost of applying. These individuals

would then be rejected as the result of a consistent screening process. Under these assumptions, a negative relationship between unemployment and the SSDI allowance rate would be reflective of a higher number of fraudulent individuals seeking benefits. The results indicate a significant negative relationship, which is consistent with the moral hazard hypothesis.

The results of these models indicate that individuals view SSDI as a form of unemployment insurance. As the purpose of SSDI is to pay benefits to workers who have suffered a medical impairment that leaves them unable to work, the results indicate that the system might encourage some moral hazard effect. The economic impact of the moral hazard considered in this paper, however, is relatively small. Considering the amount of benefits truly disabled workers receive from SSDI, the program does not currently need restructuring that addresses unemployment moral hazard concerns.

IX. Considerations for Future Research

The period over which data used for this paper did not include any fundamental structural changes in the SSDI program, or external policies that impacted the disabled community. Extending the data to include structural changes that, for instance, involved an overhaul of the screening process would allow a deeper understanding of the effectiveness of changes intended to minimize moral hazard.

A more sophisticated unemployment insurance replacement ratio regressor that includes particular states workers compensation laws, as well as the specific benefits received for specific work terminations could be included. Inclusion of this regressor would lead to a deeper understanding of the relationship between unemployment insurance and SSDI. If a regressor

representing an accurate reflection of unemployment insurance attractiveness had a negative relationship with SSDI application, further evidence for moral hazard would be present.

Inclusions of demographic specifics could lead to a deeper understanding of moral hazard. If a specific demographic reacts to moral hazard in SSDI more, policy could be better constructed address moral hazard on a case by case basis. Also, testing for those aged 62 allows a deeper understanding of the relationship between SSDI and SSR as 62 is the minimum age SSR benefits become available.

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Appendix A. Summary Statistics:

Variable	Mean	Standard Deviation	Minimum	Maximum
Applications	4489.499	4694.697	29	31672
Allowance Rate	37.28142	7.400079	20.4	70.6
Unemployment	.06011125	.0244121	.021	.142
Disability Insurance Replacement Ratio	.3507904	.05598	.19718	.482513
Disability Prevalence	286330.9	288253.3	18000	1605000
Proportion of Population between 50 and 65	.176758	.0200006	.111301	.234707
Proportion of Population above 65	.1282222	.0178002	.057497	.181685
Unemployment Insurance Replacement Ratio	.1850109	.0303784	.091874	.259142
Poverty Rate	.1267394	.0336253	.045	.231
Disability Beneficiary Proportion of Population	.0502432	.012927	.027069	.1066667
Proportion of Population Applying for SSDI benefits	.0007608	.0002716	.0000474	.0027101

Appendix B. Correlation Matrix

Variable Name	applications	proportion of population between 50 and 65	proportion of population above 65	unemployment rate	unemployment insurance replacement ratio	previous month acceptance rate	SSDI replacement ratio	disability prevalence	poverty rate
proportion of population between 50 and 65	-0.0774*								
proportion of population above 65	0	0.4687*							
unemployment rate	0.3112*	0.3772*	0.0371*						
unemployment insurance replacement ratio	-0.1612*	-0.1650*	0.1559*	-0.1384*					
previous month acceptance rate	-0.1782*	0.0352*	-0.0132	-0.1750*	-0.0889*				
SSDI replacement ratio	-0.1033*	0.2129*	0.2012*	-0.0217	0.3904*	-0.3515*			
disability prevalence	0.9619*	-0.1036*	-0.0257*	0.2670*	-0.1615*	-0.1564*	-0.1347*		
poverty rate	0.2873*	0.1388*	0.1096*	0.4668*	-0.1966*	-0.3905*	0.1543*	0.2422*	
disability beneficiaries proportion of population	-0.0287	0.1465*	-0.0879*	0.024	-0.1539*	-0.0124	-0.0654*	-0.0315	0.0097

Appendix C. Statistical Anomalies

Anomalies tests with SSDI applications as dependent variable	P-value for test
Wooldridge test for autocorrelation in panel data H0: no first-order autocorrelation	F(1, 21) = 37.876 Prob > F = 0.0000
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity H0: Constant variance	chi2(1) = 10471.22 Prob > chi2 = 0.0000
Pesaran's test of cross sectional independence	Average absolute value of the off-diagonal elements = 0.480 Pr = 0.0000
Hausman Test Ho: difference in coefficients not systematic	chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) 272.99 Prob>chi2 =0.0000

Anomalies tests with SSDI allowance rate as dependent variable	P-value for test
Wooldridge test for autocorrelation in panel data H0: no first-order autocorrelation	F(1, 21) = 37.876 Prob > F = 0.0000
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity H0: Constant variance	F(1, 21) = 111.103 Prob > F = 0.0000
Pesaran's test of cross sectional independence	Pr = 0.0000 Average absolute value of the off-diagonal elements = 0.169
Hausman Test Ho: difference in coefficients not systematic	chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) =42.06 Prob>chi2 = 0.0000

Appendix D

Table 5: Determinants of Proportion of Population Applying

Variable Name	Parsimonious Estimation with Clustered Standard Errors	Estimation with Clustered Standard Errors	Parsimonious Estimation with Driscoll/Kraay Standard Errors	Estimation with Driscoll/Kraay Standard Errors
Unemployment rate	.0012118* (.0006158)	. 0013845** (.0001398)	.0012118*** (.0003978)	.0013845*** (.0004216)
SSDI Replacement Ratio	.0002721 (.000341)	.0006323* (.000348)	. 0002721 (.0002254)	.0006323*** (.0002245)
Disability Prevalence	9.73e-11 (1.03e-10)	.0015682 (.0006803)	9.73e-11* (5.33e-11)	1.19e-10** (5.66e-11)
Δ proportion of population between 50 and 65	-	-.0094252*** (.0011719)	-	-.0094252* (.0049551)
Δ proportion of population above 65	-	-.0087102*** (.0021458)	-	-.0087102 (.0096896)
Unemployment Insurance Replacement Ratio	-	-.0002654* (.0001398)	-	-.0002654** (.0001082)
Previous Month Acceptance Rate	-	-.0000101 (.0000872)	-	-.0000101 (.0000439)
Poverty	-	-.0004767** (.0003563)	-	-.0004767*** (.0001191)
constant	.0005036*** (.0000536)	.0005852*** (.0000836)	.0005036*** (.0000339)	.0005852*** (.0000445)
R^2	0.1950	0.2016	0.1950	0.2024

7353 observations. State and year dummies are not reported. Standard errors are in parentheses. Significant at *90%, **95%, ***99%

Appendix E.

Table 6: Results without inclusion of Proportions of Populations.

Variable Name	Applications as Dep. Var. Estimation with Clustered Standard Errors	Applications as Dep. Var. Estimation with Driscoll/Kraay Standard Errors	Allowance Rate as Dep. Var. Estimation with Clustered Standard Errors	Allowance Rate as Dep. Var. Estimation with Driscoll/Kraay Standard Errors
Unemployment rate	17278.62*** (7374.183)	17278.62*** (2654.123)	-71.36442*** (16.82273)	-121.2672*** (15.97358)
SSDI Replacement Ratio	6227.623 (3872.759)	6227.623** (2664.682)	-7.055379 (10.95985)	-28.8394** (12.53107)
Disability Prevalence	.00861*** (.0024792)	.00861*** (.0014382)	-1.32e-06 (2.19e-06)	-1.22e-07 (1.32e-06)
Unemployment Insurance Replacement Ratio	554.5984 (3048.545)	554.5984 (1311.396)	5.861352 (6.303952)	5.9337 (5.263829)
Previous Month Acceptance Rate	1452.968** (639.9187)	1452.968*** (326.0479)	-	-
Poverty	-1738.407 (1774.534)	-1738.407 (1272.654)	-8.388256 (7.490126)	-18.34609*** (6.205692)
constant	-1107.604 (1031.024)	-1107.604* (596.8512)	17.49023*** (2.267725)	49.53705*** (1.412849)
R^2	0.2570	0.2570	0.5571	0.5571

7353 observations. State and year dummies are not reported. Standard errors are in parentheses. Significant at *90%, **95%, ***99%