A Structural Model of Social Security's Disability Determination Process

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Abstract

We estimate a multi-stage sequential logit model reflecting the structure of the disability determination process of the Social Security Administration (SSA), as implemented by state Disability Determination Service (DDS) agencies. The model is estimated using household survey information exact matched to SSA records on disability adjudications from 1989 to 1993. Information on health, activity limitations, demographic traits, and work are taken from the 1990 *Survey of Income and Program Participation*. We also use information on occupational characteristics from the *Directory of Occupational Titles*, DDS workload pressure, and local area economic conditions from unpublished SSA sources. Under the program provisions, different criteria dictate the outcomes at different steps of the determination process. We find that without the multi-stage structural approach, the effects of many of the important health, disability, and vocational factors are not readily discernible. As a result, the split-sample predictions of overall allowance rates from the sequential model performed considerably better than the conventional approach based on a simple allowed/denied logit regression.

1. Introduction

The disability determination process used by the Social Security Administration (SSA) serves as the gatekeeper for cash benefits from Disability Insurance (DI) and Supplemental Security Income (SSI) and for medical insurance for the disabled from Medicare and, in most states, from Medicaid. But the policy and budgetary scope of the process was not always this broad. In 1960 the determination process was used to evaluate about 400,000 disability applicants, whereas today the number evaluated annually is approximately 2.5 million. In part, the increased scope of the process stems from a legislated expansion in programs which rely on it to screen applicants. For example, when state programs for the low income disabled were federalized in the early seventies, the determination process was extended to the new SSI program. Moreover, most states decided that SSI recipients would be deemed eligible for Medicaid. Also, as of 1973 those receiving DI benefits for two years became eligible for Medicare. Over time this legislated expansion in the role of the process has been coupled with program growth resulting from other factors. Between 1985 and 1994 annual benefits under the two cash programs grew from $26 billion to $57 billion—increasing nearly 120 percent in current dollars. Factoring in Medicare and Medicaid, by 1994 total benefits to the disabled had grown to over $100 billion per year.[1] Entitlement spending on this scale argues not only for more analysis of applications decisions, but for an expanded focus on the complex procedure for determining eligibility.

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[1]See *Annual Statistical Supplement* to the *Social Security Bulletin*, 1996.

The factors behind the recent program growth involve changes in (1) eligibility criteria and program administration and (2) incentives to apply for benefits. Eligibility changes occurred as a result of actions taken by Congress and the courts. Congress mandated changes in the evaluation of mental impairments and multiple impairments, for example. Court rulings liberalized the programs, especially in the areas of children's disability, benefits to addicts, and the evaluation of evidence from treating physicians, although some of these changes have been reversed by recent legislation. In terms of administrative factors, SSA has faced increases in litigation as well as major reductions in staff and consequent claims backlogs, leading to concerns that determinations may have become more lenient. Incentives to apply for benefits have been affected by changes in institutional, economic, and demographic factors. Institutional factors include cuts in state or state/federal programs serving the impaired, providing incentives for application for federal programs. Such state programs include General Assistance, workers' compensation, unemployment compensation, Medicaid, and treatment programs for addicts. Current restructuring of state programs associated with welfare reform may have similar effects. Economic and demographic factors include an aging population, the loss of blue collar jobs, unemployment, and the loss of health insurance coverage for workers and their families.

Analytically, it is useful to distinguish effects of eligibility criteria from effects of factors that induce application. The enrollment of an individual for disability results from two often mutually dependent contingencies, the probability that the individual will apply for disability benefits and the probability that the applicant will be approved, should he or she choose to apply (see Arts and De Jong 1992). That is,

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$$\text{Prob.(eligible)} = \text{Prob.(applying)} \times \text{Prob.(eligible | applying).}$$

While the decisions of applicants play a role in determining program size, it is the eligibility criteria that represent direct choice opportunities for policy makers. Moreover, as Parsons (1991), Gruber and Kubik (1994), and others have demonstrated, program stringency affects an individual's probability of applying. The eligibility criteria implicit in the screening process reflect basic normative decisions that define the population the program is intended to serve. The central concept is that of work disability—an applicant is found eligible, not because of the existence of an impairment, but because the impairment is judged to preclude meaningful work (see Haber 1967 and Nagi 1969, 1974). However, because disability determination is necessarily complex and involves judgmental elements, it is likely to be an imperfect "tagging" device. Hence, it is important to understand the structure of the screening process and how it affects the size and characteristics of the targeted population.

Unfortunately, analysts studying disability program growth face a daunting information gap. Administrative data, tied to day-to-day operations, have no information on those who have not applied and little socioeconomic information useful for understanding application behavior. In contrast, household surveys of the general population provide information on nonapplicants and on a range of socioeconomic details; however, they contain little information on an individual's actual interactions with the administering agency—information needed to relate survey information to the agency's eligibility decisions.

SSA addressed some of these issues by implementing three major surveys early in the history of the disability programs: the 1966 Social Security Survey of the Disabled, the

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1972/1974 Survey of Disabled and Non-disabled Adults, and the 1978 Survey of Disability and

Work. These surveys asked questions on health impairments and socioeconomic status that were

designed for analysis of the disability programs. The resulting data have been utilized in a

number of important studies of disability enrollment.[2] However, little effort has been devoted to

modeling the structure of the disability determination process.

In this paper we model the outcome of SSA disability determinations using survey

responses on health, functional limitations, demographic traits, and work behavior for adult

applicants. To do this, we exact-matched data from the 1990 Survey of Income and Program

Participation (SIPP) to SSA records on disability determinations. We adopt a structural

approach, using a multi-stage logit model which mimics the sequential process by modeling

separately decisions made under distinct criteria. For example, SSA's decisions at some steps

are based solely on medical evidence and health-related activity limitations, while decisions at

other steps also take into account age, education, and past work. The matched data, combined

with the structural representation of the process, enable more appropriate use of survey data in

explaining eligibility outcomes. In addition, this approach allows us to study the effects of such

factors as the latest recession, workload pressures, or court decisions, by considering not only

how they affect the eligibility of different types of applicants, but also how they affect decisions

at each step or, equivalently, decisions made under distinct criteria.

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[2] See, for example, Halpern and Hausman (1986) and Leonard (1986) who used the Survey of Disabled and Non-disabled Adults; Haveman, De Jong and Wolf (1991), Stern (1989), and Kreider (1994) who used the 1978 Survey of Disability and Work.

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The paper is organized as follows. Section II outlines the sequential disability determination process, by step. Section III introduces the four-stage sequential logit model. Section IV describes the data used in the study. Section V presents empirical findings and section VI reports split-sample analysis results. Section VII offers conclusions and discusses future research.

II. Disability Determination

The two disability programs administered by SSA use the same disability determination process, but have different, albeit complementary, objectives. The DI program is part of the comprehensive social insurance program—Old Age, Survivors, and Disability Insurance (OASDI). It is funded through payroll tax contributions allocated to the DI Trust Fund. The SSI program, by contrast, is means-tested and guarantees a minimal level of income to the poorest of the aged, blind, or disabled, provided they apply. SSI is funded using general revenues. Disability determination serves a gatekeeping function for both programs, as well as for Medicare and Medicaid benefits of the disabled. However, the disability criteria implicit in the process are unlike criteria for other programs, which typically involve self-evident or easily measurable traits, such as advanced age or single parent status. Compared to eligibility decisions for other programs, disability determination is complex and not widely understood. Yet, with the total number of applicants for the two programs now exceeding 2.5 million per year, its budgetary and welfare implications are undeniable.

SSA's first effort to develop rules for disability determination began in February 1955

when the Commissioner of Social Security appointed a Medical Advisory Committee to provide

technical advice on administrative standards. These rules implemented the "disability freeze"

under a 1954 law which prevented unintentional reductions in the retirement benefits of workers

who had experienced a period of disability. Under these provisions, disability determinations

were to be made by state agencies; these agencies continued in that role when the DI program

was enacted in 1956. The procedure described and modeled in this study is that presently used

by the state Disability Determination Service (DDS) agencies. It is used in initial determinations

or DDS reconsiderations and it accounted for over eighty percent of all allowances in fiscal year

1990. Other decisions made under the multi-layered appeal process—by Administrative Law

Judges, for example—are not modeled in this analysis.[3] The determination process is now under

review by SSA. However, although some steps will be implemented differently after the

redesign, the major components of the current sequential process will remain (see SSA 1994).

This process involves a sequence of five steps, as shown in figure 1 and discussed below.

Step 1: An Earnings Screen—As the initial step in establishing eligibility, the SSA field

office screens out applicants who currently work. Applicants are denied if they engage in

activities that are both *substantial* and *gainful*. Specifically, applicants earning more than the

substantial gainful activity (SGA) amount are denied immediately; otherwise the application is

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[3] There are five levels of decision making: (1) initial, (2) reconsideration, (3) Administrative Law Judge, (4) Appeals Council, and (5) Federal District Court.

referred to the DDS.[4] The maximum SGA amount, as of 1997, is $500 per month. Because this step is not part of the DDS medical determination, it is not modeled here.

Step 2: A Medical Screen to Deny the Least Severely Impaired—An applicant is denied at step 2 if his or her impairment (or combination of impairments) is judged not *severe*. This judgement is based on a conceptual threshold: an impairment is considered non-severe if it does not significantly limit the physical or mental abilities to perform basic work-related activities. Basic work activities include: physical functions (such as walking, standing, or lifting); sensory functions (such as seeing, hearing, or speaking); and routine mental functions (such as understanding simple instructions, responding to supervision, or adapting to changes in the work environment). Applicants are also denied at step 2 if their impairments fail the *duration test*, that is, if (1) the impairment is not expected to result in death, and (2) the impairment has neither lasted twelve months nor is expected to last twelve months.

Step 3: A Medical Screen to Allow the Most Severely Impaired—Step 3 deals with applicants at the opposite end of the severity continuum. Under step 3, the medical evidence on an applicant's impairment is assessed using codified clinical criteria relating to both the nature and severity of the impairment. These codified criteria, currently including over 100 impairments, are called the *Listings of Impairments*. Applicants with impairments meeting these criteria are allowed immediately, solely on the basis of medical criteria; remaining applicants are

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[4] The field office also verifies that the applicant has contributed for the requisite number of quarters or, in the case of SSI, does a preliminary check of eligibility based on income and assets. An applicant must be financially eligible for one or both programs to be referred to the DDS.

evaluated further in step 4. During the period 1990-1993, over two-thirds of all initial allowances for adult applicants were based on the listings.

The listings are detailed medical standards that lend objectivity and timeliness to the determination process. For major body systems, the listings describe impairments so severe that it is assumed they would prevent work that is both substantial and gainful. If an applicant's impairment presents the symptoms, signs, and laboratory findings as defined for one of the listed impairments, the applicant's impairment is said to "meet the listings," and the applicant is considered disabled. If an applicant has an impairment not included in the listings, but considered medically equivalent to a listed impairment with evidence indicating the impairment is equal in severity to a listed impairment (or more severe), the impairment is said to "equal the listings" and the applicant is allowed. Applicants neither denied at step 2 nor allowed at step 3 have impairments that, although severe, are not severe enough to consider the applicant disabled purely on medical grounds. Such applicants are evaluated in terms of their residual functional capacity and vocational factors in steps 4 and 5.

Step 4: Can Severely Impaired Applicants Work in Past Jobs—Under step 4, an applicant's *residual functional capacity* (RFC) to meet the requirements of major past jobs is considered. Applicants judged able to perform past work are denied; the remaining applicants, including those with no recent work experience, are evaluated further in step 5.

This step involves two determinations. The first is an analysis of the applicant's RFC, used in steps 4 and 5. The evaluation of residual functional capacity acknowledges the presence of a severe impairment and determines to what extent the applicant can perform basic work-

related activities despite the impairment. This analysis takes into account, for example, whether the applicant can walk, lift objects, follow instructions, and tolerate environmental conditions found in the workplace. The work-related functions considered here are the same ones considered in step 2, but they are evaluated differently. In step 2, the *presence* of such limitations is taken as evidence of a severe limitation, but in step 4 the *extent* of the limitations is considered, to compare the applicant's residual capacity with the demands of past jobs. Hence, step 4 also involves determining the requirements of past jobs, specifically, those held in the fifteen years prior to application, if they were held long enough for the applicant to learn the requisite skills. For example, if two applicants have a severe, arthritic impairment involving the legs, the applicant who held a desk job is the one more likely to be denied at this step, since he or she can continue sedentary work; by contrast, the applicant who held a physically-demanding job will probably be evaluated further in the final step.

Step 5: Can Severely-Impaired Applicants Do Any Work in the Economy—Under step 5, the applicant's residual functional capacity is considered, along with *vocational factors*, to determine whether the applicant can work in jobs other than those he or she has held. Because this is the final step, all applicants are either allowed or denied.

Applicants evaluated under this step have a severe impairment, although it does not meet the listings; in addition, they can no longer perform past work. The analysis of residual capacity from step 4 indicates whether the applicant can do sedentary, light, medium, heavy, or very

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heavy work.[5] Under step 5, the applicant's age, education, and work experience (if any) are used

to determine whether the applicant can work in employment consistent with his or her residual

capacity. This determination is based on a table called the *vocational grid*. The vocational grid,

like the medical listings, lends objectivity to the determination process, facilitating uniform

administration. To illustrate the use of the grid, suppose an applicant's impairment permits only

sedentary work. If the applicant is of advanced age, low educational attainment (six years or

less), and has held only arduous, unskilled jobs, then the applicant is judged disabled using the

vocational grid.

III. The Structural Model

Since the inception of the disability insurance program, one of SSA's objectives has

been to adjudicate claims as consistently, expeditiously, and cost effectively as possible.[6] In

principle, all disabled applicants should be allowed and all the able denied; however, as a result

of imperfections in the determination process, inevitably some able are allowed and some

disabled are denied. Due to incomplete information, and the inescapably judgmental nature of

disability determination, the process induces a substantial link between the allowance rates of the

able and the disabled. Typically, reducing the allowance rate of the able will reduce the

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[5] A separate but analogous procedure is used for nonexertional impairments such as mental impairments or environmental impairments (which relate to workplace conditions).

[6] Mashaw (1983) characterizes this as the "bureaucratic rationality." According to him, this objective has been of crucial importance in the historical development of the sequential disability determination process. The *Federal Register* (vol. 43, no. 229, Nov. 28, 1978) contains an early legislative history of the determination process. See Bloch (1992) for more discussion of the statutory and regulatory development of the disability process.

allowance rate and well-being of the disabled. Conversely, increasing the allowance rate of the disabled will also increase the allowance rate of the able, as well as program costs. One expects that any knowledgeable, social welfare maximizing government agency will balance these two conflicting objectives (i.e., allowing the disabled and denying the able) using measures of physical, mental, and vocational traits of applicants (see Parsons 1991, 1996 and Diamond and Sheshinski 1995).

Over the years, SSA has aggressively and successfully defended the determination process, which has, in principle, been endorsed by Congress and the courts. The intent of the sequential process is to provide an operationally-efficient definition of disability which can be replicated with uniformity throughout the nation. For the sake of workload efficiency, a screening strategy is implicit in the process. The least severely impaired (denied at step 2) and the most severely impaired (allowed at step 3), have determinations based solely on medical criteria. For remaining applicants—those severely impaired, but whose impairments do not meet the listings—the determination is based on medical criteria along with residual capacity, age, education, and work experience. Intuitively, the earlier decisions are more straightforward to adjudicate because they require only development of medical information, whereas medical-vocational decisions—made at steps 4 and 5—require *both* medical *and* vocational information. Hence, the process is made more efficient not only by breaking the determination down into

separate steps, each with distinct decision criteria, but by ordering the steps in terms of their informational requirements.[7]

For the purpose of model development, steps 2, 3, 4, and 5 of the sequential disability determination can be diagramed as a sequence of four binary choices, representing the chronological steps of the sequential determination, as in figure 2. The last four steps of the determination process—implemented by DDS agencies and modeled here—include four decision nodes and five final outcomes, d_2, a_3, d_4, a_5, and d_5. The decision nodes are represented above as filled circles. As shown above, d_2 = denial at the second step (node 2) based on severity of medical impairments; a_3 = allowance at the third step (node 3) based on listed impairments; d_4 = denial at the fourth step (node 4) based on residual capacity for past work; a_5 and d_5 are allowance and denial, respectively, at the fifth step (node 5) based on capacity for any other work in the economy. The indices (k, l, m, and n) denote steps of the determination process, corresponding to decision nodes 2, 3, 4, and 5.

Since the decisions are made sequentially, the probability of an outcome at a decision node can be taken to be independent of choices at prior nodes. This gives rise to the sequential logit model which separates all choices into a series of conditional binary choices as diagramed above, see Amemiya (1975, 1985). The outcome at each stage can take on one of two possible values, denoted by 1 and 0. For convenience, at each stage—k, l, m, or n—the value "1" indicates the favorable outcome from the standpoint of the applicant, i.e., either an allowance (at

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[7] The sequential process can be justified rigorously in terms of McFadden's (1975, 1976) optimizing framework.

stages l and n) or a pass on to the next stage (at stages k and m). Suppose W_k, X_l, Y_m, and Z_n are sets of explanatory variables and α, β, γ and δ corresponding parameter vectors used to evaluate the "severity" at each of the four stages. The probability of a denial at the second stage can be written as:

$$P_{k=0} = Pr(d_2) = \left[1 - F(\alpha' \, W_k)\right], \tag{1}$$

where $P_{k=0}$ is the probability of denial at step 2 (i.e., stage k in the diagram above) based on a logit regression: i.e., logit $(P_{k=0}) = \log_e (P_{k=0}/(1 - P_{k=0})) = \alpha' \, W_k$, and $F(\alpha' \, W_k) = \exp(\alpha' \, W_k)/(1 + \exp(\alpha' \, W_k))$ (see Maddala 1983). Similarly,

$$P_{l=1|k=1} = Pr(a_3) = F(\alpha'W_k) \, F(\beta'X_l), \tag{2}$$

where $P_{l=1|k=1}$ is the probability of allowance at stage 3 (or l in our notation), conditional on not being denied at stage 2 (node k), and $F(\beta'X_l) = \exp(\beta'X_l)/(1+ \exp(\beta'X_l))$. Likewise,

$$P_{m=0|k=1,l=0} = Pr(d_4) = F(\alpha'W_k)\left[1 - F(\beta'X_l)\right]\left[1 - F(\gamma'Y_m)\right], \tag{3}$$

where $P_{m=0|k=1,l=0}$ is the probability of denial at stage 4 (node m), conditional on not being denied at step 2 (node k) and not being allowed at stage 3 (node l), and $F(\gamma'Y_m) = \exp(\gamma'Y_m)/(1+ \exp(\gamma'Y_m))$. Finally,

$$P_{n=1|k=1,l=0,m=1} = Pr(a_5) = F(\alpha'W_k)\left[1 - F(\beta'X_l)\right]F(\gamma'Y_m) \, F(\delta'Z_n), \tag{4}$$

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where $P_{n=1|k=1, l=0, m=1}$ is the probability of allowance in the last stage (node n), conditional on three contingencies—not denied at stage k, not allowed at stage l, and not denied at stage m. As before, $F(\delta'Z_n) = \exp(\delta'Z_n)/(1 + \exp(\delta'Z_n))$. The corresponding probability of denial at this stage can be expressed as:

$$P_{n=0|k=1, l=0, m=1} = Pr(d_5) = F(\alpha'W_k)\left[1 - F(\beta'X_l)\right]F(\gamma'Y_m)\left[1 - F(\delta'Z_n)\right]. \tag{5}$$

We estimate parameter vectors α, β, γ, and δ sequentially over surviving subsamples. The successive sample splits representing the outcome at each step of the screening process are based on the SSA disability determination records. Note that the probability that an applicant with given characteristics is eligible for disability benefits is $Pr(a_3) + Pr(a_5)$.

Although the determination process yields five allow/deny choices, they are not ordered in terms of a single underlying index of disability severity. Only d_2 and a_3—representing the least severely impaired and the most severely impaired—can unequivocally be ordered in terms of a single latent severity distribution. While the remaining choices d_4, d_5, and a_5 fall on the central part of the severity distribution, the final determination for such cases is not based on how they are ranked with respect to each other in terms of severity. Rather, it is based on vocational and demographic factors which have an explicit statutory role for choices d_4, d_5, and a_5, but not for d_2 and a_3. Implicitly, the severity distribution is partitioned, with those on the extremes having medical determinations and the balance having medical-vocational

determinations. Hence, to estimate the eligibility probability for an applicant, one needs to

generate the outcome probabilities at each stage of a discontinuous, non-linear process.

This point has not been appreciated in much recent research on the economic effects of

disability. Disability determination has typically been modeled simply by using one underlying

index of severity, expressed as a function of health and other factors.[8] The treatment of

disability status in this body of research may be adequate to study labor supply behavior, but it is

less appropriate for analysis of the determinants of disability program growth, or the effect of

eligibility probabilities on application behavior. In recent years, Bound (1989, 1991), Oi and

Andrews (1992) and Loprest, Rupp, and Sandell (1993), among others, have emphasized the

multi-dimensional nature of disability.

IV. The Matched Data

The study relies on two principal data sources: the 1990 panel of the SIPP and SSA's

disability determination records (the so-called 831 Disability Applicant Files). The two data

sets were exact matched for SIPP sample members who applied for disability benefits and whose

applications were adjudicated during 1989-1993. In addition, we added information on:

occupational characteristics from the *Dictionary of Occupational Titles* (DOT) (DOL 1990);

workload from DDS Staffing and Workload Analysis (SWA) Reports (SSA's Office of

Information Management); and staffing, workload, processing time, and demographics at the

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[8] See, for instance, Leonard (1986), Halpern and Hausman (1986), Haveman, Wolfe, and Warlick (1988), Haveman, Wolfe, and Huang (1989), Haveman, de Jong, and Wolfe (1991), Kreider (1994), and Bound, Schoenbaum, and Waidmann (1996).

district office level from the Profiling System Database (PSD) of SSA's Office of Workforce Analysis.

The 1990 SIPP panel includes information on work disability history, work disability status, general health status, functional and activity limitations, health conditions, health care utilization, and related topics.[9] This information was collected in four topical modules over a 20-month period from June-September 1990 to February-May 1992. The health and disability questions cover: (1) the existence of a health-related work limitation and whether it prevented work, asked four times during the 1990 panel (in topical modules for the second, third, sixth and seventh waves); (2) the time of onset, expected duration of the health limitation, and the extent to which the limitation interferes with work for those limited but not prevented from working (in topical modules for waves two and seven); (3) general health status, respondents' ability to perform six sensory and physical functions (seeing, hearing, having one's speech understood, lifting and carrying, climbing a flight of stairs, and walking three city blocks), six Activities of Daily Living (ADL's) (getting around inside the home, getting in or out of a bed or chair, taking a bath or shower, dressing, eating, and using the toilet) and five Instrumental Activities of Daily Living (IADL's) (going outside the home, keeping track of money or bills, preparing meals, doing light housework, and using the telephone); and (4) the use of aids and appliances, mental conditions, housework disabilities, and health care utilization. The third and fourth categories of information were obtained twice—in the third and sixth waves. Data from the second and sixth

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[9] See Adler (1992), LaPlante (1992), and McNeil (1993) for further details. McGarry (1996) and Hoynes (1996) used the 1984 SIPP panel to study SSI (for the elderly) and AFDC-UP programs, respectively.

SIPP topical modules identify past occupations (second wave) and the extent to which health problems have caused spells of nonwork during the individual's work life (sixth wave). The second topical module provides a 3-digit occupation code (based on the 1980 Census of Population Occupation Classification) for jobs held in the 12 years prior to the survey.

Programmatic information on disability applicants is from the SSA Form 831, which is used by state DDS agencies to document the disability determinations of DI and SSI applicants. The 831 record includes administrative, diagnostic, and statistical items, although there is considerable nonreporting of statistical items. The most critical item we used from the 831 record, the Regulation Basis Code, characterizes the determination outcome in terms of the steps of the sequential process. Thus, the 831 data not only identify applicants, whether allowed or denied, but also delineate the criterion underlying each determination.

We took information on physical demands, general educational development (GED), specific vocational preparation (SVP), and environmental conditions of occupations from the DOT (DOL 1993). The Master Crosswalk Database program from the National Occupational Information Coordinating Committee (NOICC) was used to aggregate the 9-digit occupational information in the DOT to the level of 1980 3-digit census occupations (see Hundley 1993).

V. Empirical Results

As noted above, different decision criteria are used at each step of the determination process. Hence, in terms of variables with programmatic underpinnings, we expect that different sets of variables should be relevant in explaining the outcomes of distinct steps. For

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example, while steps 2 and 3 of the determination process are medical, in steps 4 and 5, the evaluation focuses on the claimant's residual functional capacity to do past work or, taking into account age, education and prior work experience, to do any work. This suggests that determinations at steps 2 and 3 should not be directly affected by age, education, or occupation, in contrast to steps 4 and 5. Thus, the explanatory power of a particular variable can be properly ascertained only if introduced at the appropriate step. This may explain why some researchers have found little predictive power for health-related survey variables in explaining final disability application outcomes, for example.

We may also find evidence of effects of variables with no programmatic underpinnings. Such variables, including certain demographic factors and indicators of business cycle fluctuations, might affect the process in a number of ways. For example, we might see evidence of such effects at step two if key demographic subgroups or those vulnerable to the recession of the early nineties had applied for disability with less severe impairments than other applicants.

Results for step 2—In this step, which follows the SGA assessment, an applicant is denied if the impairment (or impairments) is not severe, judged in terms of work-related physical, mental, and sensory limitations. The dependent variable of the step 2 logit regression assumes the value one if the applicant is passed on to the next step for further evaluation, and zero if denied. Since this is the first step modeled, we use the whole sample of 927 applicants.[10] The results are given in table 1. Individuals with three or more severe ADLs (SevereADL), one

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[10] See Lahiri, Vaughan, and Wixon (1995) for details on the development of the study sample. All empirical results reported here were generated using SAS/STAT version 6.11. Throughout the analysis, all explanatory variables with p-values greater than 0.10 were dropped. Variables definitions are given in Data Appendix.

or more severe IADLs (SevereIADL), poor health (PoorHealth), functional limitations due to mental conditions (Mental), or who never worked because of a disability (NeverWorked) are more likely to be passed on—that is, they are not denied. In terms of the associated odds ratios and marginal effects, the impairment-related variables are the most important factors leading to pass ons. DI and concurrent applicants (Title II) are also more likely to be passed on. Such applicants, as compared to the SSI applicants, are expected to apply with more severe impairments on average, since the mandatory five-month waiting period implies their opportunity cost of application will be much higher. As expected, individuals reporting good health (GoodHealth), a work limitation but able to work occasionally or irregularly (Occas.Work), or a work limitation of less than 12 months duration (Duration) have a higher probability of denial. The last variable reflects a statutory criterion: the impairment(s) must meet the duration test, that is, the impairment should have lasted or be expected to last at least twelve months or until death. In terms of health measures, our results show that both self-reported objective and subjective measures are useful predictors of severity (see Sickles and Taubman 1986, 1996). We also find that applicants younger than 35 years of age (Young) or whose prior occupations involved hazardous conditions (Environ.) tend to be denied. The negative coefficient for the latter variable suggests that marginally impaired individuals who worked under hazardous conditions have a higher propensity to apply than those not subject to hazardous conditions, but similar impairments. This finding, consistent with Burtless (1987) and Duleep (1995), indicates that hazardous work conditions tend to affect a person's ability to

continue working at full capacity, rather than the probability of becoming severely disabled in the sense of having a higher probability of death.

We find that applicants with cases adjudicated in 1990 and with recent work experience (Work/90) tend to be denied. These are likely to be mostly DI and concurrent applicants. This finding is consistent with the longstanding observation that recessionary times induce disability applications by some with impairments of dubious severity.[11] Conceivably, at the height of the last recession (which officially lasted from July 1990 to March 1991), some who were out of work, with unemployment and health insurance benefits running out, may have found enrolling for disability an attractive alternative, even if only marginally impaired. In addition, SGA—the amount that a beneficiary may earn and still be considered disabled—was raised from $300 to $500 in 1990. This increase may also have induced some marginally impaired workers to apply. It is also interesting that no time dummy variable representing the recession years played a role for people without recent work experience (mostly SSI). This result is consistent with the evidence reported by Rupp and Stapleton (1995) that the last recession affected DI and concurrent applicants more than SSI applicants.

To control for regional differences in allowance rates, we introduced dummies to represent the ten federal regions. There has long been concern over regional differences in crude allowance rates, specifically, whether applicants from one region are treated differently from those in another. See Gallicchio and Bye (1980), Marvel (1982), and Parsons (1991). Only

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[11] See Leonard (1986) and Stapleton, Barnow, Coleman, Dietrich, Furman, and Lo (1995).

four—Boston, Chicago, Dallas and Atlanta—are significant and all have negative coefficients.

Thus, *ceteris paribus*, applicants from these regions, compared to those from the rest of the

country, have a higher likelihood of denial at step 2. This variation may be explained in part by

the reaction of state agencies and ALJs to court decisions in their regions, class action suits, or

so-called "acquiescence" rulings (whereby SSA disagrees with a court decision, but agrees to

abide by the decision within the court's jurisdiction). Differences in administrative

factors—experience, training, management, individual subjectivity, and the local adjudicative

climate—may play a role in explaining the strong negative coefficient for Dallas and Atlanta

regions.[12] The negative coefficient for the Boston region is unexpected since its crude allowance

rate has historically been much higher than the national average. One explanation for the

negative coefficient is that this area was hard hit by the latest recession, which may have induced

a large number of marginally impaired individuals to apply, many of whom were (appropriately)

denied at this stage.

Differences in allowance rates by region may also reflect variation in the economic

circumstances driving applications, yielding differing mixes of more and less severely disabled

among regional applicant pools. For instance, as McGarry (1996) has emphasized, the amount

of the SSI state supplement benefit varies widely across states. To control for these forces, we

also introduced variables representing the economic condition of the District Office (DO)

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[12] The 709 report (U.S. Department of Health and Human Services, 1992) defined adjudicative climate as "the perceptions of individual disability adjudicators, based on the prevailing national attitudes regarding disability, that may affect how they apply existing formal policy in instances where some judgement is required within the specified evaluation procedures."

catchment area in which the applicant resides.[13] These variables were: percent of the civilian labor force unemployed, median home value, median household income, percent of Hispanic population, the percent of black population, percent of female population, median years of school completed, percent of the population age 65 or older, and percent of households with income under $15,000. Only the last variable (LowIncomeArea) is significant and it has a negative coefficient. This result is consistent with the hypothesis that low income areas generate more applicants with non-severe impairments, who, under the determination process, are screened out at this step. However, based on its odds ratio (0.97) and marginal effect (-0.003), this variable does not seem quantitatively important in the regression.

The regression results appear to show that the gender and race, which are not intended to play a role in the adjudication process, affect the likelihood of being found severely disabled. Specifically, males and whites (compared to blacks and others) have a higher likelihood of being passed on to the next stage (Gender and Race). Similar results have been found in a number of studies.[14] This result is consistent with findings of Bound, Schoenbaum, and Waidmann (1996) that blacks in poor health are more likely to leave the workforce than whites in poor health. They argue that the difference in responsiveness, at least in part, reflects the different social and economic conditions faced by the two populations. Two GAO (1992, 1994) reports found that, for the most part, the racial and gender differences in the crude allowance rates could be

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[13] Muller (1982) and Levy and Krute (1983) studied the effects of local labor market conditions on disability allowances using micro data.

[14] See for instance GAO (1989, 1992, 1994); Lando (1976); Levy (1980); Loprest, Rupp and Sandell (1995); McCoy, Davis, and Hudson (1994); McCoy, Iams, and Armstrong (1994); Parsons (1994); and Bound, Schoenbaum, and Waidmann (1995).

explained by differences in age, types of impairment, occupation, and other demographic

characteristics. Lando (1976) found age, educational attainment, and higher application rates

among blacks accounted for racial differences in overall allowance rates. However, unlike the

previous studies, here we are observing the race and gender effects by the sequential steps of the

determination process, after controlling—to the extent the data permit—for the severity of

impairments, occupational characteristics, and a host of other policy-relevant characteristics of

the applicant. It is possible that there is significant unmeasured variation in the level of

impairment relevant to the SSA determination across these sociodemographic groups and it may

be this unmeasured variation and not the groups' attributes per se that is responsible for the

differential outcome probabilities. For instance, there is some evidence that the women

applicants apply with less severe impairments. In samples of recent decisions, federal

physicians, who evaluate severity as part of SSA's Quality Assurance (QA) review, rated 18

percent of women compared to 12 percent men aged 55 to 64 as having (1) no disability, (2) a

disability of low severity, or (3) an impairment that would last less than 12 months (see GAO

1994). In its analysis of 1988 and 1989 initial decisions, SSA's quality assurance reviewers did

not find any racial difference. For both black and white cases reviewed, approximately three

percent of allowances and seven percent of denials showed evidence of errors (see GAO 1992).

The GAO report of 1992 also expressed concern that a high denial rate for young blacks could

not be explained satisfactorily. In addition to the gender and race effects noted above, our

results indicate that younger black applicants (age less than 35 years) have an additional

likelihood of being denied (YoungBlack). The significance of the YoungBlack variable in our

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regression underscores the concern expressed in the GAO report. It is interesting to note that in

our analysis race and gender dummies were not significant in the latter stages of the

determination process, even though the crude denial rates at the last two stages of the

determination process are even higher for elderly women (73 percent) than for elderly men (60

percent). The crude allowance rate for step 2 has been more volatile, both across states and over

time, than for other steps of the process. This has given the impression that the severity criterion

is partly subjective, more difficult to apply uniformly across diverse etiologies, and, hence, less

reliable than criteria used at other steps. Historically, there has been considerable controversy

over its application, and it has been challenged in many courts.[15]

The findings from our sequential model provide support for an interpretation that women

and blacks may, on average, apply with less severe impairments, possibly due to more limited

occupational opportunities. While race and gender effects have been noted in overall allow/deny

determination models estimated by other researchers, under our sequential approach these effects

are observed only for step 2. We noted above that some applicants applying due to the recession

or who live in low income areas may be denied at step 2 because they are marginally impaired.

The fact that race and gender effects are observed only at step 2 may suggest that these groups

are being screened at this step for the same reason. This interpretation is consistent with the

Quality Assurance finding, noted above, that a higher proportion of women apply with marginal

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[15] In 1987, the Supreme Court (Bowen vs.Yuckert (96 L. 119, 1987)) upheld the severity requirement as both efficient and reliable, since it allows SSA to identify "at an early stage those claimants whose medical impairments are so slight that it is unlikely they would be found to be disabled even if their age, education, and experience were taken into account." See Bloch, 1992.

impairments than men. Such an interpretation can best be confirmed in future analysis considering whether there are race or gender differentials in applications behavior.

There has been speculation about possible effects of a recent surge in workload pressure and backlogs on the accuracy of DDS decisions. Although DDS staffing in 1993 was almost the same as for 1986, during 1989-1993 claims increased from 1.6 million to 2.6 million--an increase of over 60% in just four years. Not surprisingly, both the backlog of pending claims and the number of dispositions per staff year have increased dramatically. SSA's recent report to the Congress (Social Security Administration 1996) considered whether workload pressures could have contributed to the increase in the recent award rates. Several arguments have been made for this hypothesis. First, when workload pressures increase it may be easier for decision makers to allow than to deny, because denials require a lengthy written rationale (CRS Report for Congress 1994). Second, there has been concern within SSA that procedures adopted at the beginning of 1992 for cases likely to be allowed may have affected the accuracy of some decisions. Specifically, some disability examiners—facing heavy workload pressures—may have made more favorable decisions in order to exploit the streamlined procedure for likely allowances (DHHS 1992). Third, to adjust for backlogs, SSA has reduced medical reviews of state agency decisions, and has questioned fewer DDS decisions under its Quality Assurance (QA) process (CRS 1994). In addition, rising caseloads are considered a catalyst for changes in the adjudicative climate that favor allowances (Koitz et al. 1992).

There has been little evidence on the effects of workload pressure and backlogs. To test for such effects, we constructed variables at the district office (DO) and DDS levels for each

year between 1989 and 1993. The variables constructed were: (1) difference in dispositions per staff-year from the national average (Workload) for state DDS agencies, (2) average processing time for DI and SSI applicants, separately, at the DO level, and (3) actual dispositions as a percent of budgeted (i.e., projected) dispositions at the DDS level. Only the first variable, Workload, was significant at step 2, but it had an unexpected, negative sign. Thus we find no evidence for the hypothesis that higher workloads are associated with more lenient decision making by adjudicators at this stage. This finding is consistent with evidence from SSA's ongoing regional QA reviews of DDS decisions, showing that the error rate in DDS allowance decisions is only around 2.5% (DHHS 1992), and has not changed over the last ten years. Our regression results, on the other hand, indicate that adjudicators under workload pressure may tend to deny more often at step 2. We should point out that dispositions per staff-year varied considerably in our sample across states and over time. In 1989 it was 189.02 for Tennessee and 251.51 for Mississippi. In 1993, workload was 211.30 for Hawaii and 333.97 for Mississippi. The negative effect of the workload variable can be rationalized in a number of ways. First, the QA results over the last couple of years have consistently shown that DDSs make more erroneous denials than allowances. For instance, the SSA regional branch QA review found that in 1991 7.6% of sampled denials and only 2.8% of sampled allowances were incorrect. Second, as part of the "preeffectuation review" (PER), at least half of all DI allowances (both initial and reconsideration) are reviewed before they go into effect. However, denials are not subject to preeffectuation reviews. Thus, the state-agency examiners face a PER process in which an award is more likely to be questioned than a denial. One might expect that this asymmetric review

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process would tilt the screening toward denials, particularly when adjudicators face heavy workloads. Nonetheless, the odds ratio and marginal effect for this variable are only .992 and -0.001, respectively.

The overall explanatory power of the model's independent variables is quite good. One measure of goodness of fit is the pseudo-R^2, which has the same type of interpretation as the ordinary least squares R^2 in a linear regression model.[16] The value was calculated to be 0.30, implying that approximately 30 percent of the variation of the underlying latent dependent variable is explained. In addition, the Goodman-Kruskal Gamma measure of rank correlation between the observed outcomes and the predicted probabilities is 0.48, which seems quite satisfactory by current standards of empirical logit models (see Agresti 1990).

Results for step 3—Step 3 of the sequential process involves assessing the nature and severity of an applicant's impairment(s) based on SSA's detailed list of medical standards, the Listings. Over sixty percent of all allowances are based on impairments that meet or equal a listing. The purpose of this step is to expeditiously allow applicants with impairments so pathological that immediate allowance, without evaluation of vocational factors, is warranted. Out of a total sample of 927, 176 applications (19.0 percent) were denied in step 2, leaving a sample of 751 at step 3. Of these, 264 (35.2 percent) were allowed at this step. The health and disability related survey data used here were not specifically designed to estimate eligibility

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[16] We report the pseudo-R^2 measure proposed by McKelvey and Zavoina (1975). Many recent studies have favored the McKelvey-Zavoina measure over a number of competing pseudo-R^2 measures for logit models. This measure mimics the ordinary least squares R^2 in the underlying linear latent model the best, and also is least vulnerable to the varying proportion of any particular outcome in the sample. See Windmeijer (1995).

under the Listings. Thus, how well the survey information explains step 3 allowances becomes an empirical question.

In table 2 we report logit regression results for step 3, with 13 statistically significant explanatory variables. A number of variables on health and activity limitations, including having 3 or more severe ADLs (SevereADL), having 2 or more IADLs (2IADL), having mental disability and no work history (Mental/NoWork) increase the probability of allowance. Throughout our analysis, the presence of a reported mental impairment proved to be the most consistent health-related variable explaining allowances (see Okpaku et al. 1994). For step 3, the odds ratio associated with the Mental/NoWork variable is 2.58 and the marginal effect is 0.21. Applicants reporting work limitations due to musculoskeletal conditions (Musculo.) tend to be passed on to the next stage (odds ratio 0.51), whereas those reporting work limitations due to sensory/neurological conditions (Neuro.) tend to be allowed more often at this step (odds ratio 2.39). Our finding that those with musculoskeletal impairments are less likely to be awarded benefits at step three is consistent with several studies conducted over the past three decades (GAO 1989; Nagi 1969; Parsons 1994). Applicants reporting an overnight hospital stay during the last 12 months (Hospital) or who never married (NeverMarried) also had a higher probability of being allowed. We speculate that these two variables reflect variation in impairment severity that is not captured by the overt survey health measures. The most severely impaired may be less likely to be married, for example. Perhaps the major finding relating to this stage is that activity limitations, medical events, and medical conditions are key explanatory variables with

relatively high odds ratios and marginal effects. This might be expected, because at this step the DDS judges whether the applicant's impairment meets or equals the medical listings.

Work/91 and Work/92 (i.e., 1991 and 1992 year dummies crossed against applicants with recent work experience) are positive, increasing the odds of allowance. Interestingly, Work/90 had a positive effect on denials in step 2. We argue above that many marginally impaired workers, after being laid off, apply for benefits and are denied at step 2. However, Work/91 and Work/92 suggest that such variables have a dual effect—that there are also a number of individuals who have worked despite severe physical or mental impairments. Because employers may have to make accommodations for the health problems of such employees, they may be more vulnerable to layoffs during periods of high unemployment. Moreover, some of these workers, if laid off, can qualify for disability benefits under the medical listings. Brehm and Rush (1988) estimated that one in eight men had an impairment that met or equaled SSA's medical listings and yet continued to work even four years after the onset of the disabling condition. Work/91 and work/92 may reflect the effects of such applicants.[17] Note that the structural approach allows us to trace at what steps business cycle effects are felt, suggesting, in this case, dual and offsetting effects.

We find that applicants who reported having a work disability due to an accident (Accident) and those unable to work in at least one of the four interviews (UnableToWork) tend to be passed on to the next step. The accident variable may have a negative coefficient because

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[17] Note that although the recession of the early 1990s officially ended in March, 1991, the percentage of individuals with declining family incomes remained elevated through 1991 and 1992 (BOC 1995). For more discussion on this point see Stapleton et al. (1995).

accident victims are often counseled by hospitals to apply for disability, although many do not meet the listings. Halpern and Hausman (1986) found a similar negative effect, but it was not significant at the 10 percent level. We also find that the average waiting time (WaitTime) between application and decision at the district office level reduces the probability of allowance. This negative effect would indicate that, as the waiting time increases, disability examiners tend to pass marginal applicants on to the next step rather than allow at step 3. As was estimated for the Workload variable in step 2, if anything the estimate shows that adjudicators were slightly *less* lenient under work pressure. However, as we observed for the Workload variable, the odds ratio (.938) is close to one and the marginal effect is -0.001. Finally, of all the Federal regions, only Seattle is significant and it has a positive sign. As pointed out in the so-called 709 report (DHHS 1992), following the *Morrison, Doe,* and *Decker* court decision in January 1990 (involving the emphasis placed on the opinion of a claimant's treating physician), the initial allowance rate in the Seattle region increased from 38% in 1988-89 to 50% by mid-1990.

As a measure of the overall explanatory power of this equation, the pseudo-R^2 was 0.16 and the Gamma coefficient was 0.41. Our estimated model could be improved if better information on the severity of medical impairments were available in the survey.

Results for step 4—Step 4 involves evaluating the applicant's residual functional capacity to meet the requirements of past work, taking into account physical, mental, and other limitations. Out of 487 applicants passed on to this stage, 133 (27.3 percent) are denied. The remaining applicants are passed on to the final step which considers their ability to do *any* work.

The estimates, mainly involving explanatory variables with program-specific underpinnings, are reported in table 3.

We find that applicants who report having difficulty walking a quarter of a mile, walking upstairs, and lifting or carrying 10 lbs. and whose previous occupations required heavy or very heavy work (FL/HeavyOccu.) tend to be denied less often. The odds ratio and the marginal effect of FL/HeavyOccu. are 4.72 and 0.287, respectively. Applicants with no recent work experience or no work history (NeverWorked) are also much more likely to be passed on to the next step, with an odds ratio of 5.23 and a marginal effect of 0.305. This finding is expected, given that step 4 assesses applicants' ability to perform past work and that persons lacking recent work experience are properly evaluated in step 5. Of applicants similarly impaired who are considered at step 4, those working in environmentally hazardous conditions (Environ.) are less likely to be able to work in the same job and are passed on to the next step (see Bresnitz et al. 1994). Applicants with no mental conditions and whose previous occupations required higher general educational development, in terms of reasoning, language, and mathematical skills (NoMental/GED), tend to be judged able to continue their previous work and are often denied-- probably because their work is not physically demanding. We also find, as expected, that applicants who reported being able to do the same kind of work despite their disability (SameWork) and those working in white collar occupations and having more than 12 years of education (WhiteCollar/Edu.) have a higher probability of being denied.

Of all the variables we constructed to represent the high workload of recent years, only one—the mean processing time for DI claims at the DO level (DIProcessTime)—is significant,

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but its marginal effect is small. The mean processing time for SSI claims was not significant; this is expected, since SSI applicants, who have less work experience than DI applicants, are readily passed on to the next stage. The Boston region, consisting of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island is significant with a positive coefficient, implying that applicants from this region are less likely to be denied at step 4. This finding may be explained in terms of two recent court cases (*Aldrich* in Vermont and *Schisler* in Vermont, New York, and Connecticut) which dealt with the importance of the opinions of the treating physicians in evaluating a claimant's subjective complaints of pain and in other cases. In early 1990, adjudicators in the Vermont DDS received extensive training in evaluating pain cases. Following this training, the overall allowance rate in Vermont soared to over 60% and continued in the 50-55 percent range for two years. Connecticut also experienced an increase in the allowance rate over the 1990-1991 period, which may be attributed to these court cases. The pseudo-R^2 for the step four regression is estimated to be 0.18, and the gamma measure for model fit was 0.43.

Results for step 5—At step 5, the applicant's age, education, and work experience are used in conjunction with an analysis of residual functional capacity to determine whether he or she can do any work in the economy. The regression results are presented in table 5. Out of 354 applicants evaluated at this step, 159 (44.9 percent) were allowed and 195 (55.1 percent) were denied. The variables we found to have notable positive effects on the probability of allowance are aged 55 or older (Old), old with low education (Old/LowEdu.), and Unskilled. These three variables are dominant in terms of their odds ratios and marginal effects; furthermore, they have

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clear programmatic underpinnings, given the roles of age and education in the context of the

vocational grid. On the other hand, younger applicants (aged 55 or younger) with no mental

conditions (Young/NoMental), applicants who do occasional work (Occas.Work), and applicants

who are young and skilled (Young/Skilled) tend to be denied more often on the grounds that

they could do some work in the economy. Of these, the OccasWork variable is most dominant

having an odds ratio of 0.08 and marginal effect of -0.61. These variables reflect the structure

of the vocational grid; hence, the survey variables play roles consistent with the criteria

underlying step 5 of the determination process.

In addition, year dummies for 1991 and 1992 were strongly positive, indicating that

applications reaching step 5 were more likely to be allowed in those years. There are several

possible explanations. Following a series of adverse circuit court decisions, the Omnibus Budget

Reconciliation Act of 1990 (OBRA 90) included a change in the way SSA adjudicates disability

claims of surviving divorced spouses and widowed beneficiaries (DWB). Prior to OBRA 90,

disability was determined for such claimants by using medical criteria to establish the inability to

do any "gainful activity." OBRA 90 made the criteria for DWBs consistent with that for other

Title II disability claims, requiring adjudicators to begin assessing the ability of the DWBs to do

prior work or any work in the economy as well. Because many of these claimants were over age

50, with limited education and work experience, they became excellent candidates for a

favorable medical/vocational decision at this final step. During 1991-92, the DWB allowance

rate was approximately twice the rate prior to the change in the statute. Since 1993 this rate has

stabilized. In addition, in response to an escalating backlog of disability claims, SSA made

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major administrative changes in 1992 to expedite case processing, such as funding for overtime and short-term changes to expedite the adjudication process. CRS (1994) argues that allowance rates in 1991 and 1992 were artificially high because of such procedures and that allowances rate would have risen as these cases were processed and fallen as tougher cases were taken up later, in 1993. Our data are consistent with the CRS hypothesis, showing that the step 5 allowance rates in 1991 and 1992 were 54% and 51%, respectively, compared to only 34% in 1993. These dummies may also partly reflect the increased effort that SSA has given in terms of its SSI outreach efforts. Changes in state and local programs may have increased incentives to apply for DI and SSI as well. As argued above, the effects of the economic recession of the early 1990's and the longer term structural changes in the job market adversely affecting low-skilled workers, were played out in this context. Our evidence suggests that the economic downturn may have had a significant effect on the growth in applicants, many of whom were severely disabled. Other things being equal, this would have had an effect on allowance rates—a conclusion which is consistent with our earlier finding that Work/91 and Work/92 were significantly positive in step 3 regression. Although the latest recession lasted officially from July 1990 to March 1991, its effect on unemployment, as in most recessions, continued for a longer period. Also, as Burkhauser, Haveman and Wolfe (1993) have shown, the more vulnerable workers, like the disabled and minorities, take the longest to recoup the ground lost during a recession.

To control for regional variation, we introduced the regional dummies and a number of DO-specific variables representing the socioeconomic condition of the local area. Only the federal region Dallas (which includes New Mexico, Texas, Oklahoma, Arkansas, and Louisiana)

and percent of households with income less than $15,000 (LowIncomeArea) are significant and both have negative signs. Dallas and LowIncomeArea are also significant with negative coefficients for step 2. These variables represent those severely impaired applicants who do not meet the listings, cannot do their past work (many of them may not have significant labor market attachment), but can do some work, in the opinion of the DDS adjudicators. LowIncomeArea suggests that in low income areas a higher number of marginally impaired applicants may apply and be passed on to step 5, resulting in a higher denial rate. However, in terms of its odds ratio (0.97) and marginal effect (-0.001), this variable does not seem very important.

The model fit for step 5 is the best of the four regressions. The pseudo-R^2 is 0.46 and the gamma coefficient is 0.69. The good fit at this stage may be attributable to the objective nature of the criterion used at this stage (the vocational grid) and to the exploitation of survey variables on demographic and labor force characteristics, rather than self-rated health variables.

Results from Pseudo-Structural Approach—We mentioned above that it is difficult to identify the effects of program-specific variables on the overall eligibility outcomes unless they are introduced at the appropriate steps of the determination. The typical approach has been to calculate eligibility probabilities by regressing the overall allowed/denied decisions on a host of health, socioeconomic, and demographic variables (see footnote 8). To illustrate this point, we ran a similar logit regression with all explanatory variables for the four individual regressions. The results are reported in table 5, which lists only variables statistically significant at the 10% level.

The estimated pseudo-structural equation with overall allowed/denied decisions as the dependent variable has a pseudo-R^2 value of 0.18 and a gamma value of 0.44, but only 12 of the 49 distinct independent variables have p-values less than 0.10. Only four of the 12 are impairment-related: SevereIADL, Accident, Hospital, and Neuro. The eight non-impairment variables are: Work/90, Occas.Work, LowIncomeArea, TitleII, YoungBlack, NeverMarried, DIProcessTime, and Young/NoMental. By comparing estimates of the pseudo-structural equation with those from the four-step sequential model we find that some objective measures of disability based on ADL's, functional limitations, and mental conditions, which were major factors in steps 2 and 3, are no longer important. Oi and Andrews (1992) argue that these objective measures of impairments should be emphasized more in disability research. In addition, almost all the variables representing residual functional capacity, age, education, skill, and occupation that were found to be significant in the last two steps are no longer relevant. Also, many variables relating to gender, race, time, and region that were important in the sequential model are no longer significant in the pseudo-structural estimation.

VI. Predictive Performance

One of the advantages of structural modeling is that covert changes in the nature and characteristics of applicants can be reflected in model predictions in an appropriate manner. The ultimate success of the structural model depends on how well it predicts final allowances and denials. The prediction of an aggregate percentage such as the percentage of the population eligible for a public benefit, or as in our case, the percentage of applicants allowed for disability

benefits, is often an important problem faced by policy makers. There are two ways a disability

applicant can be allowed under the determination process: (1) at step 3, one's impairment can

meet or equal the listings, conditioned on not being denied at step 2, and (2) at step 5 one can be

allowed, conditioned on not being denied at step 2, not being allowed in step 3, and, finally, not

being denied in step 4. Thus, as explained in section III, the final probability of being eligible

can be expressed as:

$$Pr(a_3) + Pr(a_5) = F(\alpha'W_k)F(\beta'X_l) + F(\alpha'W_k)[1 - F(\beta'X_l)]F(v'Y_m)F(\delta'Z_n)$$
$$= P_{l=1|k=1} + P_{n=1|k=1,l=0,m=1}$$

(6)

See also equations (2) and (4). Note that each applicant will have a non-zero probability of a

particular outcome at each step of the sequential process. Given the observed health indicators

and other characteristics of an individual, we first generate $F(\hat{\alpha}'W_k)$, $F(\hat{\beta}'X_l)$, $F(\hat{v}'Y_m)$, and

$F(\hat{\delta}'Z_n)$ for each individual from the four estimated logit regressions. These individual

probabilities are appropriately processed as shown in equation (6) to calculate the total

probability of allowance for that particular individual. The probabilities are then averaged over

the sample to obtain a consistent estimate of the prediction for the percentage of allowances (see

Amemiya 1985). Note that [Pr (a_3) + Pr (a_5)] + [Pr (d_2) + Pr (d_4) + Pr (d_5)] = 1, i.e., the final

probabilities of allowance and denial must sum to unity for each individual.

We have studied the out-of-sample predictive capacity of the model through extensive

split-sample analysis. First, we estimated the four regressions corresponding to the steps of the

sequential determination process, using data from 1989 to 1993. We repeated the estimation five

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times, each time deleting observations for one of the five years. We then calculated the out-of-sample prediction for the final eligibility probability (using equation (6)) for all individuals represented in the sample year set aside. For instance, we first estimated the structural equations for steps 2-5 using data for 1989-92. (The sample sizes for the regressions for steps two through five were 641, 517, 325, and 233, respectively.) These estimated regressions were used to predict a_3 and a_5 probabilities for each of the 286 applicants in 1993 using equation (6). The out-of-sample predicted allowance rate was 42%. The actual allowance rate for the 1993 applicants was 40%, indicating a 5% overestimation of allowances. By using the same methodology, the out-of-sample predicted allowance rates for the years 1992, 1991, 1990, and 1989 were calculated to be 55 % (actual 52%), 52% (actual 54%), 40% (actual 38%), and 44% (actual 46%), respectively. Thus, over the five years the predictions seem well calibrated, and we see no systematic over- or under-prediction of the aggregate allowance rate observed for our sample. When we conducted a similar out-of-sample prediction exercise using the single pseudo-structural equation of table 5, the predicted allowance rates were 37%, 48%, 45%, 29%, and 37% for the years 1993 through 1989, respectively. Thus, these predictions, summarized in table 6, are consistently less accurate than those based on the multi-step sequential model.

As a first attempt to model the structure of the SSA disability determination process using self-reported SIPP survey data and data from other sources, we find that the sequential model yields quite accurate predictions. This holds despite evidence that the standard (*viz.*, the DDS determination decision) against which we are evaluating the survey predictors is subject to

some uncertainty. As we have noted above, recent quality assurance (QA) results consistently

show that nearly five percent of the initial decisions can be erroneous.[18]

VII. Conclusions and Future Research

In this paper we model the structure of the SSA disability determination process using

household survey data on health, demographic traits, work, and activity limitations. We use data

from the 1990 panel of the Survey of Income and Program Participation that have been exact-

matched to administrative records on disability determinations for SIPP sample members who

applied for disability between 1989 and 1993. The study also exploits information on current

and past occupations of applicants from the *Dictionary of Occupational Titles*, workload

pressures at the DDSs, and local area economic conditions from unpublished SSA sources.

Using matched data for a sample of applicants has permitted us to model disability

determination, as implemented by state DDS agencies, with data from a recurring household

survey.

We model the structure of the disability evaluation process using a four-stage sequential

logit model. The key is that, under the program provisions, different decision criteria dictate the

outcomes at distinct steps of the determination process. For instance, steps two and three are

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[18] Based on an experiment in 1969, Nagi (1969) reported that in the opinion of an independently appointed group of clinicians the SSA adjudicators mis-judged almost 27% of all initial claims. Similar findings are reported in Smith and Lilienfield (1971) and Gallicchio and Bye (1980). See also Parsons (1996). However, in order to facilitate equity and uniformity in decisions, the Congress enacted the Disability Insurance Amendments of 1980 (PL 96-265) to tighten the performance standards of state DDSs. Since then the error rates on initial DI and SSI decisions have fallen steadily and have stabilized to less thanfive percent for the last ten years.

medical in nature, whereas the last two steps are based, in part, on applicants' residual functional capacity, age, education, and past occupations. Detailed administrative information on outcomes at each step of the determination make the multistaged approach possible.

The typical approach in previous studies has been to run a single logit regression of overall allowed/denied decisions, on a host of health, socioeconomic, and demographic variables. We compared such a pseudo-structural equation approach with our model of the actual sequential structure. Specifically, we demonstrate that without the multistaged structural approach, it is difficult to estimate the impact of more objective survey health variables, such as functional limitations, ADLs, and IADLs, on the disability determination outcome. Also, a number of variables representing the vocational grid were not significant in the pseudo-structural equation. Hence, many variables with program-specific underpinnings that we found to be important in our staged sequential regressions did not have discernible effects in the pseudo-structural logit regression. As a result, we find that the split-sample predictions of overall allowance rates from the sequential logit model perform considerably better than those generated by the pseudo-structural model.

Throughout our analysis, the presence of a reported mental impairment proved to be an important health-related variable explaining allowances and pass ons. This is of interest, given the changes in the handling of mental impairments introduced in the mid- and late 1980's. We found that applicants with musculoskeletal conditions tend to be denied more often than, for example, applicants with sensory and neurological conditions. Our regression results also demonstrate that survey data on functional, ADL, IADL, and work limitations, including those

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related to mental impairments, can, when used in the context of a structural model, be of considerable value in predicting SSA allowances and denials.

We note effects of race and gender that have been considered in earlier research. Although the race and gender biases in crude allowance rates are most prominent in the later steps of the process, we could explain these effects in terms of the residual functional capacity and vocational characteristics of the applicants. We see evidence of unexplained race and gender effects at step 2, the first medical screen, but not at later steps. This can possibly be explained by the fact that if more women and blacks apply with less severe impairments, then many will be screened out at this step. We find two offsetting recessionary effects. On the one hand, there is evidence that recessionary periods may induce some with recent work experience to apply for benefits, many of whom qualify under SSA's Listing of Impairments. On the other hand, both recessionary years and poor areas also tend to generate applicants many of whom do not meet the severity threshold and are (appropriately) denied at the first medical screen.

We find evidence that particular Federal regions or Judicial districts affect allowance probabilities. Crude allowance rates vary significantly across regions, raising concerns that applicants from different regions of the country may be treated differently. Considering this issue requires evaluating class action law suits and SSA's "acquiescence" rulings. Our estimates suggest that applicants from the Seattle region (in step 3) and those from the Boston region (in step 4) have an elevated probability of favorable treatment (allowance or pass on) attributable to three major court decisions—*Aldrich* (in Vermont), *Schisler* (in Vermont, Connecticut, and New York) and *Morrison, Doe, and Decker* (in Seattle). Four federal regions (Dallas, Atlanta,

Boston, and Chicago) have negative and significant effects in step 2, possibly due to differences in the applicant pools for these regions; further research is needed.

Finally, we considered several workload variables at each step to test whether DDS adjudicators have become more lenient as a result of increased workload pressures in recent years. At step two, one variable tested—Workload—is significant, but with an unexpected sign. Similarly, at step three the variable WaitTime is significant, but has an unexpected sign. A third workload variable—DIProcessTime—is significant at step four with the expected, positive sign. However, for all three variables the odds ratios and marginal effects suggest that their quantitative effects are minuscule. Hence, we see almost no evidence that workload pressures led to more lenient decisions.

We have estimated the eligibility model using data only on applicants without appropriately controlling for economic and other factors which induce prospective applicants to actually apply. Presumably much of the unobserved heterogeneity that exists among applicants can be explained once we develop and estimate a model describing application behavior. By matching the SSA master beneficiary records, earnings records, and the SIPP longitudinal files to our existing data set, and opening our analysis to non-applicants, we are now developing a comprehensive model of disability behavior, in which "eligibility" and "application" are two mutually dependent components of the model. This effort will allow us to distinguish analytically between eligibility criteria—which reflect the efforts of policy makers to control the size and targeting of the programs—and application incentives, in terms of their effects on program growth.

Variable Definitions

Step two

SevereADL	: Having three or more severe ADLs in wave 6;
SevereIADL	: Having one or more severe IADLs in waves 3 and 6;
PoorHealth	: Poor on a 5-category self-evaluative scale of health status, in wave 6;
GoodHealth	: Excellent or very good health in wave 6;
Mental	: Functional limitations caused by mental conditions in wave 6 ;
Duration	: Work limited but lasted less than 12 months in wave 6;
Occas.Work	: Able to work occasionally or irregularly in wave 2;
NeverWorked	: Never been able to work at a job in wave 2;
Young	: Age less than 35 on the filing date;
Environ	: Previous occupation involving four or more hazardous work conditions. For each 9-digit occupation, DOT identifies the following work conditions: exposure to weather, extreme cold, extreme heat, wet and/or humid, noise, vibration, atmospheric conditions, proximity to moving mechanical parts, electrical shock, high or exposed places, radiant energy, working with explosives, toxic or caustic chemicals, and other hazards. The (0,1) dummies indicating four or more hazardous work conditions at the 9-digit level were aggregated to the 3-digit level using Crosswalk;
TitleII	: Title II or concurrent applicants (SSA 831 data);
Work/90	: Applicants had recent work experience (reported in wave 2) and the decision year was 1990;
Gender	: An applicant is male;
Race	: An applicant is white;
YoungBlack	: Age less than 35 years and black;
Workload	: Difference in the dispositions per FTE staff year between state and the national levels collected from DDS staffing and workload analysis reports for years 1989 to 1993 (SSA Office of Systems, Office of Information Management);
LowIncomeArea	: Percent of households with income under $15,000 at district office (DO) level. These are U.S. Census data, and are available through the Profiling System Database of SSA's Office of Workforce Analysis;
Boston	: Federal Region I which includes Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island;
Chicago	: Federal Region V which includes Minnesota, Michigan, Indiana, Ohio, Wisconsin, and Illinois;
Atlanta	: Federal Region IV which includes Kentucky, Tennessee, North Carolina, South Carolina, Alabama, Mississippi, Georgia, and Florida;

| Dallas | : Federal Region VI which includes New Mexico, Texas, Oklahoma, Arkansas, and Louisiana. |

Step three

Hospital	: Reporting a hospital stay overnight or longer in the past 12 months in both waves 3 and 6;
SevereADL	: Defined in step two;
2IADL	: Having two or more IADLs in both waves 3 and 6;
Mental/NoWork	: Mental disability and no work history in both waves 3 and 6;
UnableToWork	: Reported unable to work at least once in one of the four waves;
Accident	: Health conditions caused by an accident or injury in wave 2;
Musculo	: Functional limitations caused by musculoskeletal conditions in wave 6;
Neuro	: Functional limitations caused by special senses and neurological disorders in wave 6;
WaitTime	: Average waiting time (in days) between the filing date and the date of decision at district offices;
NeverMarried	: Marital status is never married (wave 3);
Work/91	: Having recent work experience and the decision year was 1991;
Work/92	: Having recent work experience and the decision year was 1992;
Seattle	: Federal Region X, which includes Washington, Oregon, Idaho, and Alaska.

Step four

FL/HeavyOccu of	: Having one of the three functional limitations (FL)--difficulty walking 1/4 a mile, walking upstairs, and lifting and carrying 10 lbs. (wave 6), and previous occupation requiring 10-20 lbs. (heavy work) or in excess of 20 lbs. (very heavy work) of force constantly to move objects, as defined in DOT. First, the (0,1) dummies for the strength factor at the 9-digit level were aggregated to the 3-digit level using Crosswalk. We then defined Heavy Occupation as a dummy taking the value one if the aggregated value at the 3-digit level was nonzero and 0 otherwise;
SameWork	: Having work limitations, but able to do the same kind of work in wave 2;
NoMental/GED	: No mental conditions and occupation requiring general educational development (GED). The GED Scale ranging from 1-6 is composed of three divisions: Reasoning Development, Mathematical Development, and Language Development. Using Crosswalk database, we used the average of these scores aggregated over all 9-digit occupations;
WhiteCollar/Edu.	: Education ≥ 12 years and white collar occupation (sales and services);
Environ	: Defined in step two;
DIProcessTime	: Mean overall processing time for all DI initial claims from the DO Profiling System Database, SSA's Office of Workforce Analysis;
Boston	: Federal Region I, defined in step one.

Step five

Old/LowEdu	: Older than 55 years, education less than 11 years, and previous occupation unskilled as defined in DOT (specific vocational preparation, SVP, requiring short demonstration up to one month only);
Young/NoMental	: Younger than 54 years and reported no mental conditions;
Old	: Older than 55 years;
Unskilled	: Previous occupation requiring SVP between short demonstration and up to one month;
HeavyOccu	: Previous occupation requiring heavy or very heavy work;
Occas.Work	: Defined in step two;
Young/Skilled	: Previous occupation was skilled (SVP more than 6 months), age less than 54 years, and had one or more severe functional limitations or ADLs;
Dummy91	: Decision year was 1991;
Dummy92	: Decision year was 1992;
Dallas	: Federal Region VI, defined above;
LowIncomeArea	: Defined in step two.

References

Aarts, Leo J. M. and Philip R. De Jong. *Economic Aspects of Disability Behavior.*
North-Holland, Amsterdam, 1992.

Adler, Michele. "The Future of SIPP for Analyzing Disability and Health." *J. Econ. and Social
Measurement* 18 (1992): 91-124.

Agresti, Alan. *Categorical Data Analysis.* John Wiley and Sons, New York, NY, 1990.

Amemiya, Takeshi. "Quantal Choice Models." *Annals of Economic and Social
Measurement* 4 (1975): 363-372.

Amemiya, Takeshi. *Advanced Econometrics.* Harvard Univ. Press, Cambridge, MA, 1985.

Bloch, Frank S. *Disability Determination: The Administrative Process and the Role of Medical
Personnel,* Studies in Welfare Programs and Policies, No. 13, Greenwood Press, Westport,
CT, 1992.

Bound, John. "The Health and Earnings of Rejected Disability Insurance Applicants." *A.E.R.*
79 (June 1989): 482-503.

Bound, John. "The Health and Earnings of Rejected Disability Insurance Applicants: Reply."
A.E.R. 81 (December 1991): 1427-1434.

Bound, John, Michael Schoenbaum, and Timothy Waidmann. "Race and Education Differences
in Disability Status and Labor Force Attachment." *J. Human Resources* 30 (Supplement
1995): S227-S267.

Bound, John, Michael Schoenbaum, and Timothy Waidmann. "Race Differences in Labor Force
Attachment and Disability." *National Bureau of Econ. Research* Working Paper No. 5536,
Cambridge, MA, (April 1996).

Brehm, Henry P. and Thomas V. Rush. "Disability Analysis of Longitudinal Health Data:
Policy Implications for Social Security Disability Insurance." *J. Aging Studies* 4 (1988): 379-
399.

Bresnitz, Eddy, Howard Frumkin, Lawrence Goldstein, David Neumark, Michael Hodgson, and
Carolyn Needleman. "Occupational Impairment and Disability among Applicants for Social
Security Disability Benefits in Pennsylvania." *American J. Public Health* 84 (November
1994): 1786-1790.

Burkhauser, Richard V., Robert H. Haveman, and Barbara L. Wolfe. "How People with Disabilities Fare When Public Policies Change." *J. Policy Analysis and Management* 12 (Spring 1993): 251-269.

Burtless, Gary. "Occupational Effects on the Health and Work Capacity of Older Men." In *Work, Health, and Income Among the Elderly*, edited by Gary Burtless, The Brookings Institution, Washington, DC, (1987): 103-142.

Congressional Budget Office. *Status of the Disability Programs*. Report to the Congress, Washington, DC, 1992.

Diamond, Peter and Eytan Sheshinski. "Economic Aspects of Optimal Disability Benefits." *J.P.E.* 57 (May 1995): 1-23.

Duleep, Harriet O. "Occupational Experience and Socioeconomic Variations in Mortality." Working Paper No. 65, Social Security Administration, Office of Research and Statistics, 1995.

Gallicchio, Sal and Barry Bye. "Consistency of Initial Disability Decisions Among and Within States." Staff Paper No. 39, SSA Publication No. 13-11869. Office of Research and Statistics, Social Security Administration, 1980.

General Accounting Office. *Social Security Disability: Denied Applicants' Health and Financial Status Compared With Beneficiaries,'* Washington, DC, GAO/HRD-90-2, November 6, 1989.

General Accounting Office. *Social Security: Racial Difference in Disability Decisions Warrants Further Investigation,* Washington, DC, GAO/HRD-92-56, April 21, 1992.

General Accounting Office. *Social Security Disability: Most Gender Difference Explained,* Washington, DC, GAO/HAS-94-94, May 21, 1994.

Gruber, Jonathan and Jeffrey D. Kubik. "Disability Insurance Rejection Rates and Labor Supply of Older Workers." *National Bureau of Econ. Research* Working Paper No. 4941, Cambridge, MA, 1994.

Haber, Lawrence D. "Identifying the Disabled: Concepts and Methods in the Measurement of Disability." *Social Security Bulletin* 30 (December 1967): 17-34.

Halpern, Janice and Jerry A. Hausman. "Choice Under Uncertainty: A Model of Applications for the Social Security Disability Insurance Program." *J. Public Econ.* 31(November 1986): 131-161.

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Haveman, Robert, Barbara Wolfe, and Fung Mey Huang. "Disability Status as an Unobservable: Estimates from a Structural Model." *National Bureau of Economic Research* Working Paper No. 2831. Cambridge, MA, 1985.

Haveman, Robert, Barbara Wolfe, and Jennifer Warlick. "Labor Market Behavior of Older Men, Estimates from a Trichotomous Choice Model." *J. Public Econ.* 36 (July 1988): 153-175.

Haveman, Robert, Philip R. de Jong, and Barbara Wolfe. "Disability Transfers and the Work Decision of Older Men." *Q.J.E.* 106 (1991): 939-949.

Hoynes, Hillary Williamson. "Welfare Transfers in Two-Parent Families: Labor Supply and Welfare Participation Under AFDC-UP." *Econometrica* 64 (March 1996): 295-332.

Hundley, Greg. "The Effect of Comparable Worth in the Public Sector on Public/Private Occupational Relative Wages." *J. Human Resources* 28 (Spring 1993): 318-342.

Koitz, David, Geoffrey Kollmann, and Jennifer Neisner. *Status of the Disability Programs of the Social Security Administration*, CRS Report for Congress, The Library of Congress, September 1992.

Kreider, Brent. "Labor Force Attrition, Applications to the Social Security Disability Insurance Program, Income Uncertainty, and Optimal Redistributive Taxation." Unpublished dissertation, Univ. of Wisconsin-Madison, 1994.

Lahiri, Kajal, Denton R. Vaughan, and Bernard Wixon. "Modeling Social Security's Sequential Disability Determination Using Matched SIPP Data." *Social Security Bulletin* 58 (April 1995): 3-42.

Lando, Mordechai E. "Demographic Characteristics of Disability Applicants: Relationships to Allowances." *Social Security Bulletin* 39 (May 1976): 15-23.

LaPlante, M. P. "Using the Survey of Income and Program Participation in Disability Research and Policy." *J. Econ. and Social Measurement* 18 (1992): 125-154.

Leonard, Jonathan S. "Labor Supply Incentives and Disincentives for Disabled Persons." *Disability and the Labor Markets,* edited by M. Berkowitz and M. Anne Hill, Ithaca: Cornell Univ. Press, NY, (1986): 64 -94.

Levy, Jesse M. "Demographic Factors in the Disability Determination Process: A Logistic Approach." *Social Security Bulletin* 43 (March 1980): 11-16.

Levy, Jesse M. and Aaron Krute. "The Impact of the Local Economy on the Disability Process: Further Results." Unpublished paper, Social Security Administration, 1983.

Loprest, Pamela, Kalman Rupp, and Steven H. Sandell. "Gender, Disabilities, and Employment." *J. Human Resources* 30 (Supplement 1995): S293-S318.

Maddala, G. S. *Limited-Dependent and Qualitative Variables in Econometrics.* Cambridge Univ. Press, Cambridge, MA, 1983.

Marvel, Howard P. "An Econometric Analysis of the Operation of Social Security Disability Insurance." *J. Human Resources* 17 (1982): 393-412.

Mashaw, J. F. *Bureaucratic Justice: Managing Social Security Disability Claims.* Yale Univ. Press, New Haven, CT, 1983.

McCoy, John L., Miles Davis, and Russell E. Hudson. "Geographic Patterns of Disability in the United States." *Social Security Bulletin* 57 (Spring 1994): 25-36.

McCoy, John L., Howard M. Iams, and Timothy Armstrong. "The Hazard of Mortality Among Aging Retired and Disabled Worker Men: A Comparative Sociodemographic and Health Status Analysis." *Social Security Bulletin* 57 (Fall 1994): 76-87.

McFadden, Daniel. "The Revealed Preference of a Government Bureaucracy: Theory." *Bell J. Econ.* 6 (Autumn 1975): 401-416.

McFadden, Daniel. "The Revealed Preference of a Government Bureaucracy: Empirical Evidence." *Bell J. Econ.* 7 (1976): 55-72.

McGarry, Kathleen. "Factors Determining Participation of the Elderly in Supplemental Security Income." *J. Human Resources* 31(1996): 331-358.

McKelvey, R. and W. Zavoina. "A Statistical Model for the Analysis of Ordinal Level Dependent Variables." *J. Mathematical Sociology* 4 (1975): 95-109.

McNeil, John M. *Americans with Disabilities: 1991-92, Data from the Survey of Income and Program Participation.* U.S. Bureau of the Census, Current Population Reports, Series P-70, No. 33, U.S. Government Printing Office, Washington, DC, December 1993.

Muller, L. Scott. "The Impact of Local Labor Market Characteristics on the Disability Process." ORS Working Paper Series, Number 27, Office of Research and Statistics, Social Security Administration, Washington, DC, 1982.

Nagi, Saad Z. *Disability and Rehabilitation: Legal, Clinical and Self-Concepts and Measurement*, Ohio State Univ. Press, Columbus, OH, 1969.

Nagi, Saad Z. "Gatekeeping Decisions in Service Organizations." *Human Organization*, 33 (Spring 1974): 47-58.

National Academy of Social Insurance. *Rethinking Disability Policy: The Role of Income, Health Care, Rehabilitation and Related Services in Fostering Independence*. Preliminary Status Report of the Disability Policy Panel, March.

Oi, Walter Y. and Emily S. Andrews. "A Theory of the Labor Market for Persons with Disabilities." Report prepared for the Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Resources, Arlington, VA, Fu Associates, Ltd., 1993.

Okpaku, Samuel O., Amy E. Sibulkin, and Christoph Schenzler. "Disability Determinations for Adults with Mental Disorders: Social Security Administration vs Independent Judgments." *American J. Public Health* 84 (November 1994): 1791-1795.

Parsons, Donald O. "Self-Screening in Targeted Public Transfer Programs." *J.P.E.* 99 (August 1991): 859-876.

Parsons, Donald O. "Assessing Ability-to-Work: Eligibility Screening in Social Insurance Programs." Paper presented at Econometric Society Meetings, Washington, DC, January 1994.

Parsons, Donald O. "Imperfect 'Tagging' in Social Insurance Programs." *J. Public Econ.* 62 (1996): 183-207.

Rupp, Kalman, and David Stapleton. "Determinants of the Growth in the Social Security Administration's Disability Programs—An Overview." *Social Security Bulletin*, 1995: 43-70.

Sickles, Robin C. and Paul Taubman. "An Analysis of the Health and Retirement Status of the Elderly." *Econometrica* 54 (1986): 1336-1356.

Sickles, Robin C. and Paul Taubman. "Mortality and Morbidity Among Adults and the Elderly." In *Handbook of Family and Population Economics* edited by R. Rosenzweig and O. Stark, North-Holland (Amsterdam), 1996.

Smith, R. T. and A. M. Lilienfield. "The Social Security Disability Program: An Evaluation Study." Social Security Administration, Office of Research and Statistics, Research Report No. 39, 1971.

Social Security Administration. *Plan for a New Disability Claim Process.* Department of Health and Human Services (DHHS), Sept. SSA Pub. No. 01-005, 1994.

Social Security Administration. *Growth in Disability Insurance Program Costs.* Report to the Congress, February 1996.

Social Security Administration. *Annual Statistical Supplement* to the *Social Security Bulletin.* U.S. Government Printing Office, Washington, DC, 1996.

Stapleton, David, Burt Barnow, Kevin Coleman, Kimberly Dietrich, Jeff Furman, and Gilbert Lo. *Labor Market Conditions, Socioeconomic Factors and the Growth of Applications and Awards for SSDI and SSI Disability Benefits: Final Report.* Lewin-VHI, Inc. and The Department of Health and Human Services, The Office of the Assistant Secretary for Planning and Evaluation, 1994.

Stern, Steven. "Measuring the Effects of Disability on Labor Force Participation." *J. Human Resources* 24 (January 1989): 361-395.

U.S. Bureau of the Census (BOC). "Dynamics of Economic Well Being: Income 1991 to 1992." *Current Population Reports,* Series P-70, U.S. Government Printing Office, Washington, DC, No. 49 (December 1995).

U.S. Department of Health and Human Services. *The Social Security Disability Insurance Program: An Analysis.* The 709 Report, Washington, DC, 1992.

U.S. Department of Labor (DOL). *Selected Characteristics of Occupations Defined in the Dictionary of Occupational Titles, Revised Fourth Edition.* Employment and Training Administration, U.S. Employment Service, U.S. Government Printing Office, Washington, DC, 1993.

U.S. House of Representatives, Committee on Ways and Means (HRCWM). *1991 Green Book: Overview of Entitlement Programs.* U.S. Government Printing Office, Washington, DC, 1991.

U.S. House of Representatives, Committee on Ways and Means (HRCWM). *1994 Green Book: Overview of Entitlement Programs.* U.S. Government Printing Office, Washington, DC, 1994.

U.S. National Archives and Records Administration, Office of the Federal Register. *Federal Register.* U.S. Government Printing Office, Vol. 43, No. 229, Washington, DC, November 1978.

U.S. National Archives and Records Administration (CFR). *Code of Federal Regulations:*

Employees' Benefits, Parts 400 to 499. U.S. Government Printing Office, Washington, DC, 1990.

Windmeijer, Frank A. G. "Goodness-of-Fit Measures in Binary Choice Models." *Econometric Rev.* 14 (1995): 101-116.

TABLE 1.--Sequential Logit: Step 2 of the SSA Disability Determination Model

Variable Name	Mean	Coefficient	p-value	Odds Ratio	Marginal Effect
SevereADL	0.031	1.569	0.10	4.80	0.190
SevereIADL	0.091	0.732	0.06	2.07	0.091
PoorHealth	0.281	0.722	0.00	2.05	0.087
GoodHealth	0.177	-0.468	0.03	0.62	-0.057
Mental	0.126	1.144	0.00	3.13	0.139
Duration	0.072	-0.884	0.00	0.41	-0.107
Occas.Work	0.028	-1.046	0.01	0.35	-0.127
NeverWorked	0.031	1.252	0.08	3.49	0.152
Young	0.238	-0.320	0.10	0.72	-0.039
Environ.	0.204	-0.718	0.03	0.48	-0.087
TitleII	0.712	0.405	0.04	1.49	0.049
Work/90	0.114	-0.754	0.00	0.47	-0.091
Gender	0.481	0.577	0.00	1.78	0.070
Race	0.713	0.327	0.08	1.38	0.040
YoungBlack	0.030	-0.878	0.06	0.41	-0.106
Workload	0.057	-0.022	0.04	0.99	-0.001
LowIncomeArea	21.86	-0.008	0.04	0.97	-0.003
Boston	0.050	-0.814	0.01	0.44	-0.099
Chicago	0.176	-0.808	0.00	0.44	-0.098
Atlanta	0.229	-1.035	0.00	0.35	-0.125
Dallas	0.126	-0.995	0.00	0.37	-0.121

pseudo-R^2 = 0.30   Goodman-Kruskal Gamma=0.53

Note.—Dependent variable: 1 if passed on (751 obs.), 0 if denied (176 obs.). See Data Appendix for definition of variables.

TABLE 2.--Sequential Logit: Step 3 of the SSA Disability Determination Model

Variable Name	Mean	Coefficient	*p*-value	Odds Ratio	Marginal Effect
Hospital	0.244	0.489	0.02	1.63	0.109
SevereADL	0.031	1.114	0.06	3.04	0.248
2IADL	0.215	0.721	0.00	2.05	0.161
Mental/NoWork	0.056	0.948	0.01	2.58	0.211
UnableToWork	0.609	-0.352	0.09	0.70	-0.078
Accident	0.182	-0.468	0.09	0.62	-0.104
Musculo.	0.224	-0.668	0.01	0.51	-0.149
Neuro.	0.059	0.872	0.02	2.39	0.195
WaitTime	140.6	-0.064	0.03	0.93	-0.001
NeverMarried	0.213	0.358	0.10	1.43	0.080
Work/91	0.153	0.581	0.02	1.78	0.130
Work/92	0.188	0.651	0.00	1.97	0.145
Seattle	0.032	0.826	0.09	2.28	0.184

pseudo-R^2 = 0.16   Goodman-Kruskal Gamma = 0.41

Note.—Dependent variable: 1 if allowed (264 obs.), 0 if passed on (487 obs.). See Data Appendix for definition of variables.

TABLE 3.--Sequential Logit: Step 4 of the SSA Disability Determination Model

Variable Name	Mean	Coefficient	p-value	Odds Ratio	Marginal Effect
FL/HeavyOccu.	0.060	1.552	0.04	4.72	0.287
SameWork	0.099	-0.739	0.03	0.47	-0.137
NoMental/GED	0.225	-0.725	0.10	0.48	-0.134
WhiteCollar/Edu.	0.173	-0.657	0.01	0.51	-0.121
NeverWorked	0.173	1.653	0.00	5.23	0.305
Environ.	0.359	0.644	0.01	1.90	0.119
DIProcessTime	88.03	0.012	0.01	1.01	0.002
Boston	0.055	1.007	0.09	2.73	0.186

pseudo-R^2 = 0.18   Goodman-Kruskal Gamma = 0.43

Note.—Dependent variable: 1 if passed on (354 obs.), 0 if denied (133 obs.). See Data Appendix for definition of variables.

TABLE 4.--Sequential Logit: Step 5 of the SSA Disability Determination Model

Variable Name	Mean	Coefficient	p-value	Odds Ratio	Marginal Effect
Old/LowEdu.	0.110	1.136	0.06	3.11	0.279
Young/NoMental	0.492	-1.453	0.00	0.23	-0.356
Old	0.302	1.007	0.02	2.73	0.247
Unskilled	0.171	0.807	0.10	2.24	0.198
HeavyOccu.	0.175	-0.797	0.03	0.45	-0.195
Occas.Work	0.037	-2.477	0.02	0.08	-0.608
Young/Skilled	0.199	-0.765	0.08	0.46	-0.188
Dummy91	0.161	0.877	0.02	2.40	0.215
Dummy92	0.212	0.992	0.00	2.69	0.243
Dallas	0.116	-1.112	0.01	0.32	-0.273
LowIncomeArea	21.47	-0.027	0.05	0.97	-0.001

pseudo-R^2 = 0.46   Goodman-Kruskal Gamma = 0.69

Note.—Dependent variable: 1 if allowed (159 obs.), 0 if denied (195 obs.). See Data Appendix for definition of variables.

TABLE 5.--Pseudo-Structural Model of Disability Determination

Variable Name	Mean	Coefficient	p-value	Odds Ratio	Marginal Effect
Work/90	0.114	-0.629	0.02	0.53	-0.156
Occas.Work	0.028	-1.387	0.03	0.25	-0.343
LowIncomeArea	21.86	-0.014	0.08	0.98	-0.003
TitleII	0.712	0.345	0.05	1.41	0.085
YoungBlack	0.030	-1.150	0.03	0.31	-0.284
Hospital	0.384	0.373	0.02	1.45	0.092
SevereIADL	0.199	0.584	0.00	1.79	0.144
NeverMarried	0.211	0.470	0.02	1.60	0.116
Accident	0.183	-0.619	0.00	0.53	-0.153
Neuro.	0.055	0.589	0.10	1.80	0.146
DIProcessTime	86.61	0.012	0.00	1.01	0.003
Young/NoMental	0.526	-1.003	0.00	0.36	-0.248

pseudo-R^2 = 0.18   Goodman-Kruskal Gamma = 0.44

Note.—Dependent variable: 1 if allowed (423 obs.), 0 if denied (504 obs.). See Data Appendix for definition of variables.

TABLE 6.--Split-Sample Analysis: Aggregate Allowance Rates (%)

Year Predicted	Prediction		Actual
	Sequential Model	Pseudo-Structural Model	
1989	44	37	46
1990	40	29	38
1991	52	45	54
1992	55	48	52
1993	42	37	40

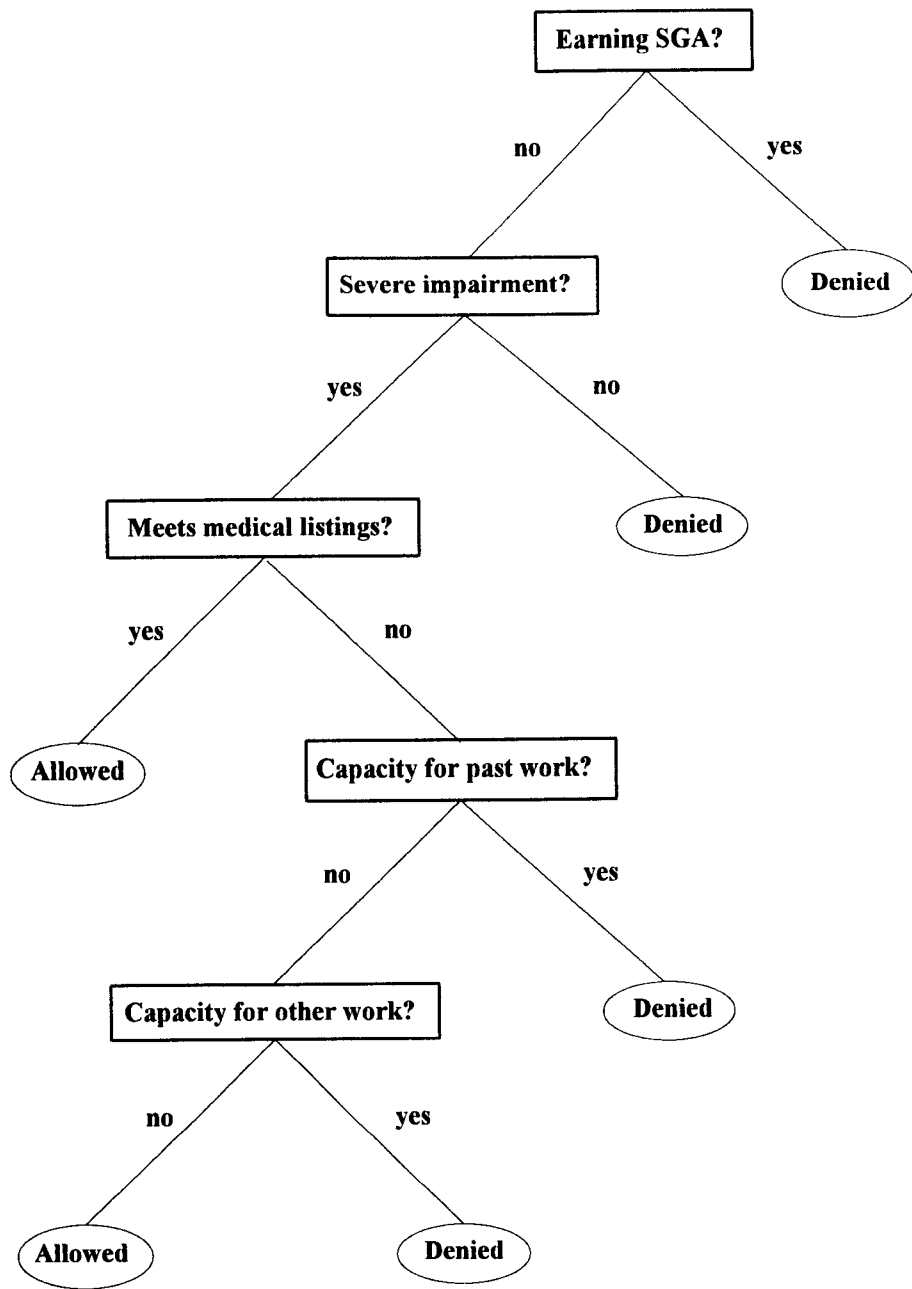Note.—Overall average actual allowance rate is 45.6% (423 allowed and 504 denied out of 927 obs.).
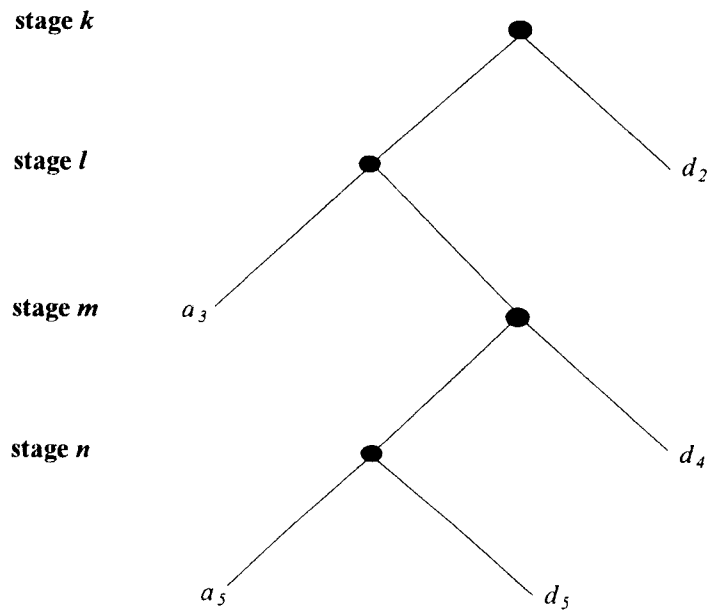
Fig. 1.---SSA disability determination process

Fig. 2.---The sequential disability determination model